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# BETTER FRUIT

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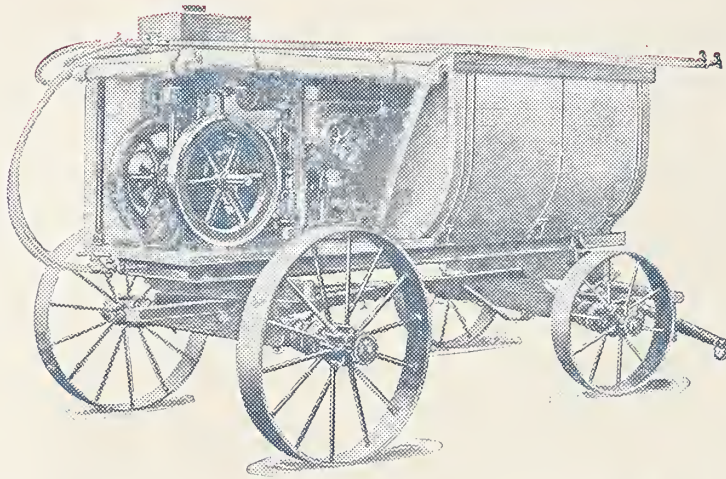
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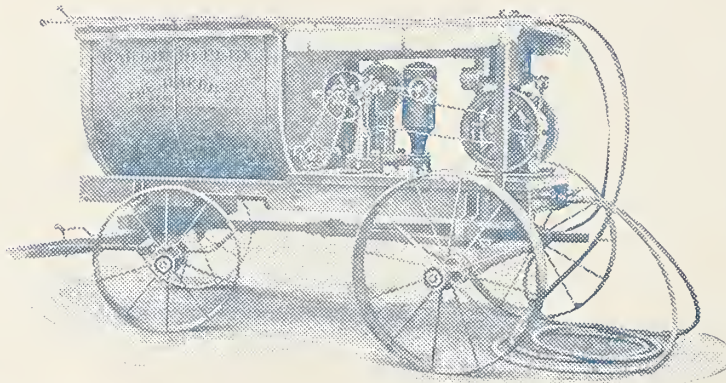
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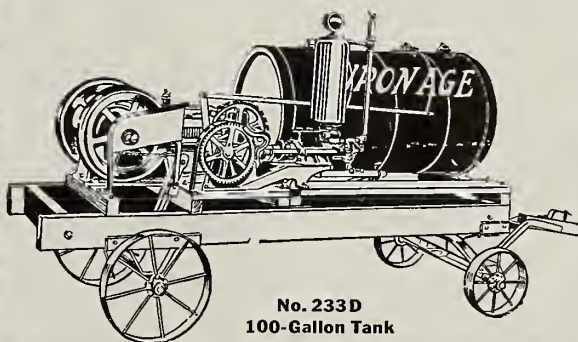
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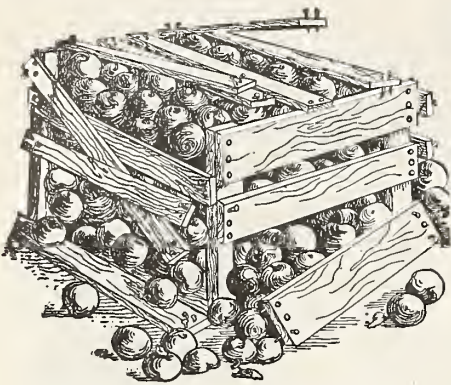
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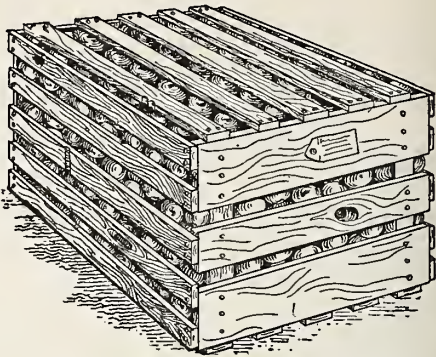
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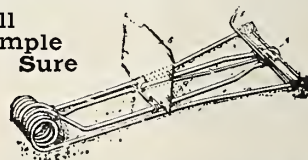
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# BETTER FRUIT

AN ILLUSTRATED MAGAZINE PUBLISHED MONTHLY IN THE INTEREST OF MODERN, PROGRESSIVE FRUIT GROWING AND MARKETING

## Combination Spraying for Insect Pests and Fungus

By Paul R. Jones, Manager and Entomologist Insecticide Department, Balfour, Guthrie & Co., San Francisco

THE business of modern fruit growing has become so competitive of recent years that every branch of the industry is now very highly specialized. Probably no other part of the fruit business has made such great strides the last ten years as the scientific treatment of the trees for the control of insect pests and fungous diseases. Not very long ago this phase of fruit growing was very little understood and most of the known insect remedies were hand-picking, lime-sulphur and kerosene emulsion. In fact, some entomologists, who advised the above remedies and no others, were known as "Kerosene Entomologists." With the greatly increased acreage of fruits that has been set out recently, and more discriminating selection by buyers and consumers, it was imperative that the growers themselves understand the control of the troubles which destroy their crops. It is not unusual now to find in any fruit section numbers of fruitgrowers who are able to tell intelligently how to control these pests, and at the same time put their methods in practice in the field. The rise and increase of these different insect pests and fungous diseases, due to many causes, has led to the use of a variety of sprays and it is of the utmost importance that wherever possible the combination of two or more materials, either for different types of insects or for insect pests and fungous troubles, shall be made with the same application, since a great part of the cost of the spraying is due to the labor in applying. This side of applied economic entomology, as related to fruit growing, is probably the most recent of any, and I will now endeavor to show some of the more recent, at the same time older, combinations which may be used in orchard - spraying practice.

The insect which started combination spraying on an extensive scale on the Pacific Coast was the Pear Thrips in California. While this insect is injurious to a number of orchard fruits, it confined most of its attacks to the pear, prune and cherry. The prune growers and cherry growers in California never had done much spraying until the Pear Thrips came along, with the possible exception of some winter treatment such as lime sulphur or crude-oil emulsion. The pear growers had been used to spraying for Codling Moth, Pear Scab, Scale and several minor troubles. On account of the short period in which the Pear Thrips was able to absolutely ruin crops it was necessary for the grower to bend

all his energy toward combating this pest. At the same time it was desirable to try and control other insect and fungous troubles during this application, otherwise more labor would be required for any other spraying and a heavier investment in spraying equipment, and it would not be possible to put on the additional applications for these other insect pests and fungous diseases in time to control them properly. The early investigations for Pear Thrips control were worked out on separate lines of oil emulsions and nicotine compounds, but it was found that the nicotine compounds did not have the required penetration into the fruit buds by themselves, and that the oil emulsions when used at a sufficient killing strength by themselves were liable to cause injury. Hence, the combination of the two was formed. After the petals had fallen it was necessary to spray for the Codling Moth, and arsenate of lead was added to this mixture. One orchard in Santa Clara County was also sprayed for Pear Scab and had the addition of bordeaux mixture to the above combination. A report on this orchard showed later that no injury to the foliage was accomplished, practically no worms were present, the crop was saved from the attacks of the Pear Thrips and no Pear Scab appeared. This orchard was treated several times with the above combination of the four different materials.

The last year or so fruitgrowers on the Sacramento River, where the Pear Thrips is quite prevalent, have been using on pears a combination of miscible oil, Black Leaf 40, arsenate of lead and atomic sulphur, all in the same tank, and obtain perfect results with each material for the purpose for which it was intended. On prunes and plums the arsenate of lead is left out unless the orchard is infested with Canker Worms. It might be well to add here that the miscible oil and Black Leaf 40, or oil emulsions and Black Leaf 40, have given very good control of the Canker Worms in the Santa Clara Valley and elsewhere just after they have hatched from the eggs and at the regular time for the Pear Thrips application. In case this application is put on rather late it is desirable to add arsenate of lead to the above mixture to catch any straggling Canker Worms that may show up. It is often possible in this way to get around using a large amount of arsenate of lead on plum and prune, the foliage of which is very susceptible to injury by this poison. The above combination has also controlled the Prune

Aphis when applied just after the petals have fallen, presumably killing the stem mothers, while applications for the adult thrips was of no avail against this aphid. Still further, in commenting on this combination in spraying prunes, where no Canker Worms or fungus was present, the arsenate of lead and the atomic sulphur were omitted, and it was noticed after the two or three Pear Thrips applications that the Brown Apricot Scale was controlled very well for the year, showing here the accumulative benefit of weak-oil emulsions. It might be well to add here that in this combination of oil emulsions Black Leaf 40 and arsenate of lead, usually no trouble is experienced out in the field, except where very hard water is encountered. Certain sections of California have such notoriously hard water that it is necessary to clean out the spray tank after each load and also use some water softener or an excess of soap with the oil emulsion. Repeated experiments last year showed that where a standard oil emulsion was diluted to a certain strength and Black Leaf 40 added at the regular thrips strength, and also Nicofume 40 added at the same strength in another test tube of diluted emulsion, that the Black Leaf 40 broke down the oil emulsion quite rapidly (this is to say, within a day or so), while the Nicofume 40 in combination with the dilute emulsion remained in solution indefinitely without the slightest bit of separation. The Black Leaf 40 evidently has more of an acid reaction than the Nicofume 40, which is supposed to be free nicotine, hence in very hard water the former will break down oil emulsions, especially if they do not contain a little more emulsifier than is absolutely necessary.

Other combinations that are used in California are crude-oil emulsions and caustic soda, or distillate-oil emulsion and the latter, for clean-up work in the winter on Scale or Moss and Lichens. The writer personally does not like to recommend a very high amount of caustic soda for two reasons: it is apt to break down the emulsions and has a habit of hardening the bark and killing the fruit buds. Even strong alkali-soap solutions added to oil emulsions contain so much caustic that they will either increase the penetration of the oil emulsion to such an extent that either one or both will destroy a large percentage of fruit buds. This was especially noticed last year in a pear orchard where a strong laundry soap was used with home-made distillate-oil emulsion, in com-





FIGURE 53—An old Italian prune tree that has not been pruned for a number of years. The scaffold limbs and lower branches have become barren through the dying off of their fruit spurs. The top of the tree is very thick and bushy and consists mainly in long, slender, weak fruit spurs and fruiting branches, like those shown in Figure 50

parison with a block sprayed with cresol soap and commercial distillate-oil emulsion. The former ruined between 90 and 95 per cent of the fruit buds, whereas the latter did not cause any damage and even stimulated the trees. An excess of caustic in the laundry soap and the amount used was probably responsible for most of the injury.

Bordeaux mixture in combination with resin soap or liquid whale-oil resin soap has been used sometimes on raspberries for Anthracnose, but has not come into general use on fruit trees. However, in certain sections of California, notably the San Joaquin Valley, it was found desirable this year to try liquid whale-oil resin soap with the bordeaux for the control of the shothole fungus, or California Peach Blight, which was very severe on some varieties of shipping plums. Ordinary bordeaux treatments on these orchards, which were irrigated many times during the summer, did not sufficiently control this trouble, and the condition was growing worse every year. However, with the addition of liquid whale-oil resin soap, bordeaux had a much better wetting and sticking power and covered all of the small twigs. It is interesting to note here that, contrary to general opinion (both popular and scientific), it was found possible to spray these plum trees in July with all

strengths of bordeaux ranging from  $2\frac{1}{2}$ - $2\frac{1}{2}$ -50 up to 8-8-50, plus 1 gallon of liquid whale-oil resin soap, per 200-gallon tank, under climatic conditions where the temperature ran as high as 110 degrees Fahrenheit, without a sign of injury. This enabled one of the large growers to get over his ranch quite easily before the winter rains began, and to get at the Shothole Fungus early, before it had injured the fruit buds for the coming year.

Miscible oils in combination with bordeaux mixture was also used this summer, both on deciduous and citrus trees, without the oils or bordeaux breaking down and without causing any injury to the foliage, fruit or trees. It must be stated here, however, that this work was only of an experimental and demonstrative nature and has not been done in any commercial way. To make this mixture a success it would be necessary to have a good miscible oil and also to be absolutely accurate in making the bordeaux mixture. The manner of using this combination was as follows: Make up the bordeaux mixture in the regular way and fill up the spray tank with water, then add the miscible oil which has previously been thinned to a thin cream. If there is any trouble with either mixture breaking down, a half gallon of liquid whale-oil soap should set everything right, and it is possible that this much soap

will have to be used in sections where very hard water is present. Prepared bordeaux paste did not work with miscible oil successfully on account of not having an excess of lime present, and a copper soap was formed. It is quite possible that this bordeaux miscible-oil combination will be worked out to be used in the Northwest soon where it is desirable to control Shothole Fungus and Scale insects with one application. But the grower should bear in mind that this should not be attempted in a commercial way at present, until more work has been done by the investigators.

Mr. Yothers in his work in Florida showed the practicability of using miscible oils in combination with soda-sulphur solutions for the Scale insects and Red Spider, and the writer expects to try these out fully the coming year under Western conditions, both on citrus trees and deciduous trees. It should be noted here in using the bordeaux and miscible oils, and also whale-oil soap, that while the home-made bordeaux worked perfectly, trouble was experienced with prepared bordeaux paste in that no excess lime was present and a copper soap was formed, which came to the top of the tank and made it difficult to force through the nozzles. Too much lime would form a lime soap. This difficulty could probably be overcome with the addition of a slight amount of caustic soda placed in the diluted miscible oils before adding it to the tank.

In the apple section of Pajaro Valley, where Mildew is quite prevalent, the combinations of arsenate of lead and atomic sulphur are quite common, the former for Codling Moth and the latter for the Mildew.

It is in this section also where lime-sulphur solution is combined with nitrate of soda, the former for its regular use and the latter for stimulation.

On grape vines in California where it is necessary to combat the Mildew and at the same time the Grape-Leaf Hopper, Black Leaf 40 is used with atomic sulphur in the second application. The first application of atomic sulphur is usually made when the growth is about 9 to 18 inches long; the second one in combination with Black Leaf 40 after the berries have set and are about the size of buckshot.

The past year or so the Cottony-Cushion Scale which at one time threatened to destroy the citrus fruit industry of California, and which presented a unique case in insect parasitism in that it was practically exterminated by the Novius (*Vedalia*) *Cardinalis*, has been developing to quite an extent as a pear pest. Strange to say, this Scale only appears on the Winter Nelis variety with maybe a few scattering individuals on the Buerre Hardy. The *Vedalia* does not seem to control this scale at all on pears, although many attempts have been made to make it to work properly. The continuous spraying with arsenicals probably forces enough of the poison into the cottony mass to poison the lady



bugs, or at least make it distasteful for them. At any event the Vedalia did not control this insect and it was necessary to devise some means of artificial control. Spraying with oil emulsions and using crude oil as high as 35 to 40 gallons per 200-gallon tank failed to control this insect, and the pears were sticky and smutty by picking time, due to the work. Experiments last year showed that a miscible oil, used about 12 gallons per 200-gallon tank in combination with several gallons of cresol soap (extra) to increase the wetting power and penetration, controlled this insect admirably and succeeded in killing most all of the eggs. In addition to this the treatment stimulated the trees very materially, and they came out in bloom ten or fourteen days ahead of unsprayed trees, and set a much heavier crop. Laundry soap applications in combination with home-made distillate-oil emulsion killed the scale quite readily, but the fruit buds also, and was abandoned by the owner of the orchard in favor of the miscible oil and cresol-soap combination. This combination, or one such as miscible oil in combination with liquid whale-oil soap, could probably be adjusted and used to advantage in the Northwest for fall applications of the Woolly Aphis, and also for Scale insects where great wetting power and penetration is desirable without increasing the oil content very materially. In fact the oil content can be cut down below normal for these fall applications after the extra soap is added.

Lime-sulphur solution and Black Leaf 40 have been used to advantage in the Northwest and elsewhere for scale, fungus and aphid. Wilson, in "Biennial Crop Pest and Horticulture Report" for 1913, recommends combination of lime sulphur 1-10, plus Black Leaf 40, 1-900, just after the fruit buds open to destroy the Aphis stem mothers. This also has the advantage of being a scalecide.

It is often necessary to know what mixtures do not combine. Never mix

lime-sulphur solution with bordeaux, nor use lime-sulphur solution with any oil emulsion. In the latter case oil emulsion is broken down by the action of the lime, which forms a calcium soap and free oil results, which will cause injury. Neither is it possible to mix lime sulphur, oil emulsion and arsenate of lead together. Never mix home-made lime sulphur and salt with arsenate of lead, but the commercial lime-sulphur solution can be and is

used quite extensively with the lead. Sometimes, however, an improperly balanced lead containing free arsenic will form a black precipitate (lead sulphide) when mixed with the lime-sulphur solution. Tri-plumbic arsenate of lead does not cause this to so great an extent as the standard lead. Black Leaf 40 can be used with a good bordeaux mixture, but do not combine free nicotine such as Nicofume 40 with bordeaux.



FIGURE 54—The same tree shown in Figure 53 after pruning. Pruning has consisted mainly in the removal of dead branches and dead fruit spurs and a rather severe thinning out of the remaining live ones

## Pruning the Bearing Prune Tree

By Professor V. R. Gardner, Oregon Agricultural College, Corvallis

[NOTE—Illustrations 49 to 52, inclusive, in connection with this article appeared in the February edition of "Better Fruit."]

UNTIL the prune tree reaches bearing age there seems to be very little need for training or pruning it in a way different from that commonly employed with the apple or pear. The aim in each case is to develop quickly a good, strong framework to support the fruiting wood and the fruit crops of later years. When the time comes, however, to bring the tree into bearing its pruning should be somewhat different from that of the pomaceous fruits, for it has a fruiting habit that is quite distinct from theirs.

### How the Fruit-Spurs of the Prune Are Formed

In order to explain why certain pruning practices are desirable with the prune, it is necessary that there

first be a correct understanding of its fruiting habits. Accordingly at this point it will be well to consider how and where the fruit-spurs of the prune tree are formed. A well-grown prune tree four or five years old will have, before its winter pruning, from ten to twenty-five or thirty strong, vigorous shoots of the past season's growth. These will vary in length from eight or ten to fifty or sixty inches. Some spring from three or four-year-old wood, or even from the main trunk. Most of them, however, spring from last year's branches. As a rule trees of the age indicated possess more shoots than it seems desirable to retain, and it is generally considered good practice to remove some of them. We will assume that this is done and

that, in accordance with the common practice, most of those that are to remain are headed back moderately. When growth begins in the spring the terminal buds of all the unheaded shoots are almost certain to start to vegetate and from them are produced new shoots, thus increasing the spread and height of the tree. In the case of the headed shoots, usually several of the lateral buds near the end start to develop new shoots that increase the height and spread of the tree in the same way as shoots from terminal buds. But it is not only terminal buds and a few lateral buds near the upper end of last year's shoots that start in the spring. A great many of the lateral buds start, though generally it is only a few of the more favorably placed ones





FIGURE 55—An old Italian prune tree that one year ago was in much the same condition as that shown in Figure 53. At that time it was pruned in the same manner as the tree shown in Figure 51. Note the increased vigor and stockiness of the old fruiting branches and fruit spurs, and the watersprouts springing from the scaffold limbs. Good fruiting wood can be developed easily from these watersprouts

near the ends of last year's growth, or near the end of what is left of it after the winter's pruning, that are able to develop new shoots. From the other buds are produced only short branches, which, because of their position, the shortness of their internodes (closeness of their joints) and their subsequent behavior, we call spurs. These spurs may become several inches long the first season, though as a rule they are much shorter.

If these spurs are examined during the growing season they will be found to possess several leaves apiece, and in the axil of each leaf is a bud. Their leaves are of normal size, and the buds in the axils of these leaves are of normal appearance. The only difference between the spur and the ordinary leafy shoot apparently is in length. However, examination of one of these spurs during the dormant period will show that some of its buds are leaf-buds and some are flower-buds. Invariably its terminal bud is a leaf-bud. Some of its lateral buds are likely to be leaf-buds, but a large proportion of them are flower-buds. Here, then, is the mechanism by means of which the prune tree bears its fruit. It occurs as a short branch, lateral to the main direction of growth of the limb from which it springs, and terminating in a leaf-bud. The flower-buds themselves are lateral, being borne singly in the axils of the

leaves. When the leaves are very close together, the internodes being very short, the flower-buds may seem to be clustered, but an examination of the spur during the summer shows that each bud is subtended by a leaf. It will thus be seen that the fruit of the prune is borne laterally on spurs.

It should be explained here that this is intended as a description of only the ordinary fruiting habit of the prune. Some varieties frequently show some variation from this method of fruit-bearing. Especially is this true of young trees growing vigorously and of watersprouts on older trees. With them there is a tendency to produce lateral fruit-buds near the base of the new shoots, and at the sides of the regular axillary leaf-buds, after the manner of the peach. However, these are to be regarded as rather special, though not abnormal, cases. The majority of prunes are borne on spurs.

#### How the Fruit-Spur Grows From Year to Year

Since the fruit-spur of the prune terminates in a leaf-bud that starts to vegetate about the same time that its lateral flower-buds open, the spur increases in length at the same time that it is producing fruit. By the end of the second season it consists of an older portion that has borne fruit, and of a newer portion that possesses a terminal

leaf-bud and a number of lateral flower and leaf-buds, these lateral buds having been borne in the axils of the leaves of the preceding season. The fruit-spur is thus ready to bear fruit again the following year. Under normal conditions it may be expected to fruit and elongate during the third and fourth and during succeeding years, in the same way it fruited and increased in length during the second season. A fruit-spur, once formed, tends to live a good many years. So far as we know, there is no factor connected with its manner of growth to set a definite limit to its age. It is possible that as it becomes older it loses some of its vigor and finally becomes unable to produce good fruit. To prolong the life of the individual fruit-spur, or more accurately, the period during which it is capable of producing good fruit, should be one of the main objects of pruning practice. The prune orchard is maintained for the prunes it will produce, and if a very large percentage of its fruit is borne upon fruit-spurs their number and productiveness should be studied with reference to every orchard operation, and particularly with reference to pruning, for obviously the various pruning practices directly effect them.

#### The Difference Between Good and Poor Fruit-Spurs

In describing the manner of growth of the fruit-spur of the prune, one important characteristic was not noted. It is that the portion of the spur that bears fruit any one season produces only very small leaves during that season and no leaves at all during succeeding seasons. The only part of the individual fruit-spur producing leaves during any summer is the new portion developing from the bud that terminated last season's growth. This is because the flower-buds of the prune are practically flower-buds only, and not mixed buds like those of the apple and pear. As the spur elongates year after year, it comes to consist of a long barren basal portion and a short terminal productive and growing portion. Examination of the fruit-spur system in almost any old prune tree will disclose many fruit-spurs that have become very long, slender and willowy. It is not uncommon to find individual spurs eighteen or twenty inches long, only the terminal one or two inches of which produce leaves and fruit and possess fruit-buds and leaf-buds for the following season. In the same tree will be found short, stocky spurs, sometimes not more than one or two inches long. It hardly need be pointed out that of the two kinds the latter are greatly to be preferred. They usually average more fruit to the spur, hold their fruits from being blown about so much by the wind, keep them from becoming limb-rubbed, and are themselves less subject to accident. In fact, it is the long slender spurs that are usually the first to become weak, produce smaller fruits, and finally die. It may almost be said that a marked lengthening of the spur instead of its remaining short and stocky is a sign of weakened vitality, the first indication



of approaching death. Though generally weaker, the long, slender spurs are by no means always older than the shorter ones. Stockiness or slenderness of spurs in the prune tree is very largely dependent upon the light received by individual spurs. An abundant light supply permits the elongated spur to develop a good, well-lighted leaf system with short internodes (joints close together). A poor light supply forces the spurs to grow out long and slender in order properly to expose their leaf surface. This is probably the main reason why the spurs in the very top of the tree average much shorter and stockier than those in the interior of the tree.

#### The Ideal Distribution of Fruit-Spurs in the Prune Tree

We want not only a large number of short, vigorous fruit-spurs in the prune tree, but it is desirable that those spurs be well distributed. A good distribution of fruit-spurs means having a considerable amount of small fruiting branches in the lower part of the tree and not having them all crowded together in its upper and outer portion. The trees of many bearing prune orchards consist mainly of barren scaffold limbs, terminating in large numbers of small spur-bearing branches that occupy a comparatively narrow space around the outside and that quite completely shade the interior. In these trees the load of fruit is borne at a considerable distance from the main trunk, thereby placing the greatest possible strain upon the scaffold limbs and crotches. Were this load more evenly distributed over the scaffold limbs, as it would be if there was fruiting wood in the lower and interior portion of the tree, there would be much less breaking of limbs and splitting at the crotches than we now find in our prune orchards.

The same factor, limited light supply, that causes individual fruit-spurs to become weak and finally die, acts in the same way upon fruiting branches. It first forces them to grow long and slender in order to reach up to the light. Finally finding themselves out-distanced in the struggle for existence, these branches die off and the scaffold limbs are left with longer and longer barren stretches.

#### Pruning That Keeps Individual Fruit-Spurs Stocky and Well Distributed

It will be inferred from the statements that have been made that the most important thing to do in pruning the bearing prune tree is to thin it sufficiently to admit an abundant light supply to the small fruiting branches and to the individual fruit-spurs. There is certainly good reason to believe that this practice is one that most closely harmonizes with and tends to improve its natural fruiting habits. This is far from stating that prune trees should never be headed back. Without doubt, the strong vegetative shoots that frequently appear even in old trees should be judiciously headed back. Likewise, individual fruit-spurs can often be headed back to a lateral branch of the



FIGURE 56—An old Italian prune tree that two years ago was in much the same condition as that shown in Figure 53. At that time it was pruned in the same manner as the tree shown in Figure 51. Note that not only have the old fruiting branches and their fruit spurs been invigorated and made more stocky, but a considerable amount of new fruiting wood has been developed. Renovation can hardly be said to be complete, but considerable progress has been made in that direction, and that without sacrificing a single fruit crop

same spur and thus be made more stocky, rather long, slender fruiting limbs may be cut back to make them more stocky. Nevertheless, it would seem that a large part of the pruning of the bearing prune tree should be a judicious thinning out of the smaller branches (branches half an inch or less

in diameter). This necessarily involves the removal of a certain amount of bearing wood; but if the amount removed is not too great, the loss will be more than compensated by the increased stockiness and vigor of the remaining fruit-spurs, and by the increased size of the fruits that they bear.

## Powdery Mildew of Apples

[Washington State Agricultural Experiment Station Bulletin]

THE powdery mildew of apple is due to the parasitic fungus, *Podosphaera leucotricha*, the vegetative body or mycelium of which develops as a coating of minute interlacing whitish filaments on the parts of the plants attacked. The fungus produces two spore stages in its life history: the conidial or summer spores which are produced throughout the growing season and give to affected parts a whitish powdery appearance; the ascigerous stage, which gives rise to the ascospores. The latter is produced only upon the twigs, and the bodies bearing the ascospores may be found buried in the dark-felted mycelial mass toward

the end of the growing season. The conidia serve to spread the fungus during the growing season. It is apparent that the fungus is carried over the winter by mycelium which hibernates in the buds and also by the ascospores. The part which the latter play in the life history of the fungus is somewhat problematical. The mildew confines its attacks in the main to young shoots and blossom clusters. Both stem and leaves of shoots may be affected and either killed, deformed or reduced in size and vigor. Blossom clusters may be blighted and young fruits may be affected later than at the blossoming period. The mildew is





FIGURE 57—An old Italian prune tree that four years ago was “dehorned” for purposes of renovation. Since that “dehorning” little or no pruning has been done. Last year the tree bore a small crop of prunes on spurs that developed on the watersprouts stimulated by the “dehorning.” There is promise of a medium crop this year, but the newly-formed spurs in the lower part of the tree are already showing signs of weakened vigor because of too much shading. To keep them from becoming long and willowy and finally dying, considerable thinning out is necessary. Heading back, which would stimulate the formation of more watersprouts, would increase the trouble. This figure and its explanation should be compared with Figures 53-56 and the explanations accompanying them

known on the fruits of pear also. The amount of blighting of blossoms varies in different localities. Secondary infections may occur on mature leaves to a limited extent.

The control of the disease calls for the employment of two methods, (1) pruning and (2) the application of fungicides. In light attacks of mildew it seems probable that pruning alone will suffice, while in orchards where the disease has gained considerable headway spraying must be resorted to in addition to the pruning. (1) Pruning. It is known that infested buds on badly-mildewed shoots produce seriously-diseased shoots the following spring. Spraying will not prevent these infections, so the affected shoots should be removed and destroyed by burning. This may be done at any time consistent with horticultural practice, and if not done earlier should be made a part of the regular dormant pruning operations. If mildew is serious it will be advisable to prune out more brush than

ordinary to stimulate the growth the following season. In general, the pruning practice should aim to eliminate close interlacing of branches and vigorous shoots of the current year's growth should be cut back one-third to one-half. (2) Spraying. The time of application of the spray may be given first consideration. It has been demonstrated that winter spraying is without effect on mildew in California. It has not yet been determined whether this holds for Washington conditions or not, but it is probable that such will be the case. The times of spraying to be recommended are as follows: (a) Just after the petals fall. (b) In connection with the second spraying for codling moth or earlier if the mildew is serious. (c) Three or four weeks after the second spraying. It may be necessary to spray a fourth time after a like interval if mildew is serious and conditions continue favorable.

The selection of the fungicide is a matter of considerable importance and

should depend in part at least upon what other diseases are present in an orchard. In some sections of Washington powdery mildew is the only fungous disease of apples that is present, but in others the orchard must be protected from scab also. In case scab is present the regular lime-sulphur treatment (1-30) for this disease should prove of value in the control of mildew. The number of sprayings for scab will vary according to conditions and the severity of the disease. Those most generally recommended are as follows: (1) Just as the blossom buds separate and show pink. (2) Just after the petals fall. (3) Ten days to two weeks later. Experience will show whether the first only or all of these applications are necessary. If the mildew is bad additional sprayings may be necessary for this disease alone, and in this case it may be advisable to employ one of the sulphur sprays recommended below.

If powdery mildew is the only disease for which protection is sought one of the following fungicides may be used: (1) Atomic sulphur or some other finely divided form of sulphur. Atomic sulphur may be used at the rate of 2-6 pounds to each 50 gallons of water. It seems probable that the minimum strength recommended will give as effective protection as the more concentrated solutions. (2) The iron-sulphide mixture. The rather laborious method described in the reference given below does not seem to be necessary, at least for the drier sections of Washington. The modified Ballard formula is as follows. Iron sulphate (copperas), 4 pounds; lime-sulphur, 33 degrees Beaume, 1 gallon; water, 200 gallons. A stock solution of the iron sulphate should be made and one pound to the gallon is a convenient strength. Fill the sprayer tank, start the agitator, add the lime-sulphur and slowly add the requisite amount of iron-sulphate solution. In order to insure complete precipitation of the iron sulphide a slight excess of lime-sulphur may be used. The necessary insecticides like Black Leaf 40 or lead arsenate may be added to either the atomic sulphur or the iron sulphide mixture.

[Editor's note—Hood River growers found modified formula unsatisfactory; now use precipitating method.]

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# The English Walnut Culture in the Pacific Northwest

By A. A. Quarnberg, Vancouver, Washington

THE English or Persian Walnut is a thrifty, fine-growing tree with clean light-gray body, symmetrical head and dark-green foliage, and under favorable soil and climatic conditions attains great size and long life. While being decidedly ornamental and filling the requirements for a first-class shade tree, it is planted chiefly for its valuable nuts, and, where it succeeds well, its culture should take a prominent place among the industries of the country. English Walnuts are a nutritious and wholesome food, and while formerly used mainly for dessert and confectionery purposes, they are now fast coming in favor as a regular article of diet and more used in many substantial table preparations. They may also be converted into a valuable oil used both as a food and a medicine, and immature walnuts, when tender and entirely free from woodiness, may be used for pickles, catsups, etc. By reason of the many uses of walnuts their consumption in the United States has increased more rapidly than the production, and with the present heavy importations there is but little danger of overproduction for some time to come. We are just at the beginning of successful walnut culture in the Northwest; some progress has been made, but there is much yet to learn. However, enough has been done to prove beyond a doubt that walnut growing here offers great opportunities for the future. With thousands of acres of land with soil and climatic conditions suitable for walnut growing, we certainly should produce not only all the nuts consumed at home, but large quantities to ship to other less-favored localities as well.

While experience has shown that under proper conditions the walnut will grow and bear in the Northwest so as to justify its planting, it must be remembered that walnuts cannot be set out anywhere and of any variety with assurance of success. Thousands of dollars have undoubtedly already been wrongfully expended in walnut planting on the northern Pacific Coast, resulting in many failures and disappointments which could have been avoided by careful and intelligent selection of lands and varieties for planting. The first and most vital requisite for success in walnut growing is land with the proper soil and exposure; then the selection of good blight-resistant varieties well suited to the locality, and, lastly, good care. Walnuts require deep, rich soil, the deeper and richer the better; in other words, they require soils well supplied with plant food and plenty depth to retain the necessary moisture during the dry season, yet, at the same time, well drained and free from standing water. Walnut trees cannot resist sour, seepy soils, nor can they be expected to do much or resist the blight successfully on coarse, sandy, shallow and poorly-watered

lands without plenty of fertilizers and irrigation. Furthermore, the success of walnuts planted in a frosty locality, even with good soil, is very doubtful. Without good care of the trees the planter is surely doomed to disappointment.

There are mainly two distinct strains of walnuts grown on the Pacific Coast, the Santa Barbara Soft Shell types and the French varieties. The Santa Barbara types, while being vigorous and strong growers, bud out early in the spring, are liable to injury by spring frosts and blight, and, generally speaking, do not succeed well in the Northwest. But the French varieties, which begin their activities later in the season, have shown themselves well suited to the country's condition, and have practically demonstrated the possibilities of commercial walnut growing in the Pacific Northwest.

Grafted trees bearing high-grade nuts are to be preferred for planting on account of the uniformity of the product. While there are some fine and valuable second-generation seedling trees, these seedlings have not proven entirely satisfactory, as they are sometimes found to vary in growth and productiveness and their nuts often differ

in size, shape and flavor. If seedlings are planted they should be propagated from nuts carefully selected in every respect. Grafted trees should have select stock, not only for the top but for the root as well, for upon the root depends in a large measure the life and value of a tree. Good results have been obtained from grafts on Northern Californian black, and Eastern black-walnut roots, as well as from strong roots of the English varieties and certain hybrids; but, while it cannot be expected that any one root will be the best under all conditions, the Northern California black is now quite generally considered to be one of the best average root stock for English walnut trees in the Northwest.

The commercial value of a walnut tree depends upon its growth and productiveness and the size, shape, color, smoothness, sealing and self-hulling quality of the nut and flavor, size, plumpness and color of the kernel. The old French varieties such as Franquette, Parisienne, Mayette, Meylan and others, possessing in a high degree the qualities which make good commercial nuts, at present are, and will probably continue to be, the standard selection for planting in the Northwest unless



FIGURE 58—An old Italian prune tree that four years ago was partially "dehorned." Note that the treatment apparently had little influence upon the vigor of the small fruiting branches and individual fruit spurs of the limb not cut back





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some new variety particularly adapted to the existing conditions and requirements should develop. At present, the Franquette seems to be the most popular and probably is one of the best, if not the best, varieties to plant. While it appears that good crops may generally be secured from the planting of the Franquette entirely, I am sure that they would be benefited by proper cross-fertilization, and until the fertilizing characteristics of our standard walnuts are more definitely known it seems to me that some intermingling of varieties which blossom at the same time would be safer and at least tend to better fertilization, and consequently larger and better crops of nuts. In California several new varieties of reasonably well-established merits such as the Concord, Wiltz-Mayette, Eurica and others have of late been planted quite extensively, and some of them are also now being tried in the Northwest with promising results.

Under favorable conditions the English walnut trees attain great size, and therefore should not be planted less than fifty feet apart; on good land sixty feet is not too much for perfect development of the trees when nearing mature age. In urging a good distance between walnut trees and to show how necessary it is to have plenty of space, the great growth of three old European trees and one in Clarke County, Washington, may be cited. The Beachemwell tree in England had a height of 90 feet; spread, 120 feet; diameter of trunk, nearly 10 feet, and a yield of 1000 pounds of nuts a season. A tree in France lived to be at least 300 years old; had a spread of 125 feet; trunk 14 feet, and yielded 1500 pounds a season. The giant walnut tree in Crimea reached the age of 1000 years and for a long time yielded about a ton of nuts

annually. The walnut tree on the Resch place, about three miles north of Vancouver, Washington, now 32 years of age, has a trunk of eight feet in circumference; height, 52 feet; spread, 73 feet, and this season bore 350 pounds of nuts.

With walnut trees planted the proper distance apart, many consider clean cultivation a waste of land while trees are young, and others must get something from the land for living until the trees come into bearing, and therefore it often becomes desirable to interplant walnuts with other quick-maturing fruit trees as fillers, or to grow hoed or cultivated crops in the wide spaces between the rows. Such interplanting I do not consider especially objectionable, provided the fillers are removed when the walnut trees require the land, and the hoed or cultivated crops are not planted close enough to rob the walnut trees of their necessary moisture and plant food.

For best results the utmost care should be taken in the planting of walnut trees, and the less exposure, mutilation and injury to the roots in transplanting the better it is for the tree. When the land has been staked off, large holes should be dug to give the roots plenty of room and thereby facilitate their rapid development. For this purpose it is a very good plan to blast the holes with dynamite, especially when there is a layer of subsoil too hard for the roots to penetrate, or even check them in their downward growth, which in most cases seems essential to the best development of the walnut. This blasting should preferably be done in the autumn while the soil is dry, and is undoubtedly inexpensive and effective, as one stick of dynamite placed three or four feet deep will crack up and loosen hard subsoils

for several feet around. One way to make holes for the dynamite is to drive a crowbar into the ground; but probably a better way is to use a soil auger, which readily bores through even the harder subsoils. In planting the trees the ends of the roots should be trimmed with a knife by smooth, slanting cuts, and the best soil should be carefully and firmly packed around the roots and also used as much as possible in filling the holes.

Young walnut trees require and respond to good care by vigorous and rapid growth, and unless the land is very rich it will pay to stimulate them with barnyard manure or other fertilizers. Walnut trees are gross feeders and will readily take up almost any fertilizer, and can hardly be over-fertilized. Most young rapid-growing walnut trees require staking, and often it is necessary to train and tie up some branches to proper shape. They should be headed about five or six feet from the ground and for the first few years require attention to give the head the proper form, but after that need but little in the way of actual pruning.

Seedling walnut trees are somewhat slow in coming into bearing, but the generally accepted idea that the walnut is normally very late in bearing is not entirely true, as grafted trees usually have a few scattered nuts three and four years from planting, and sometimes even sooner, and increasing annually thereafter with the age and size of the tree. It is reasonable to estimate that a good fifteen-year-old tree will produce on an average from forty to fifty pounds of cured nuts a year; and, in favorable localities, crops, though some may be heavier than others, may be expected and reasonably depended upon every year. While the returns per acre from a walnut grove may not be so large or so soon realized as with some other fruits, it is on the increase almost indefinitely, and a staple price for walnuts is easier to maintain than with more perishable crops.

Walnut trees are comparatively free from insect pests, and aside from the walnut blight no serious disease has yet attacked the walnut. No variety can be said to be entirely free from blight, but the disease varies greatly with different varieties and different seasons. As yet no specific remedy has been discovered; the only solution to the blight problem now seems to be to keep the trees in good, healthy condition, and to grow the most blight-resistant varieties, with which the chances for loss will probably be no more than with other varieties of fruit.

In the Willamette and the Columbia River Valleys walnuts usually mature and begin to drop about the last week in September, and most of the crop is generally harvested the first two weeks in October, so that by the middle of that month the walnut harvest is completed. As the nuts mature the hulls crack open and the nuts usually roll out clean and drop to the ground or are dislodged by shaking the trees.



They are then picked from the ground at least once a week during harvest time, and three or four pickings are generally necessary to gather the crop. When gathered the nuts are thoroughly washed in water and spread on trays to be dried in the sun or in a fruit dryer. In the sun, walnuts will cure in about three or four days' time; if left out over night the nuts should be protected from dews.

Walnuts are one of the few crops which is rather benefited than damaged by rain during harvest time, provided the nuts are not allowed to remain on the ground long enough to mildew and discolor. In wet weather walnuts must be dried in well-ventilated dryers with heat from 80 to 90 degrees Fahrenheit; high heat will start the oil and injure the meat and flavor of the nuts. Good nuts may be spoiled in drying, and proper curing is an important part of walnut growing. Thus far Northwestern-grown walnuts have been sold without any kind of bleaching; most of the French varieties do not really have to be bleached to sell readily on the market. After the nuts have been properly cured, the test of which is a brittle meat, they are assorted and graded ready for packing and marketing. It is a singular fact that the Northwestern-grown walnuts are usually cured and ready for the market about the same time as the Santa Barbara Soft Shells are in Southern California.

In conclusion, it should be said that the walnut should appeal not only to the orchardist, but to the general farmer and town-lot owner as well, and all should have a few trees where they will grow. The culture of English walnuts is attractive in many respects; they are a reasonably sure crop; they do not require an immediate market; they are well known, and there is always a demand for them at fair prices. The trees are out of the ordinary in that they combine the ornamental, the useful and the profitable in the highest degree possible. Thrifty English walnut trees with their handsome dark-green foliage and crop of nuts certainly are beautiful, and give us pleasure, profit and satisfaction; and then, too, they are something permanent and will live and maintain their beauty and productiveness almost indefinitely.

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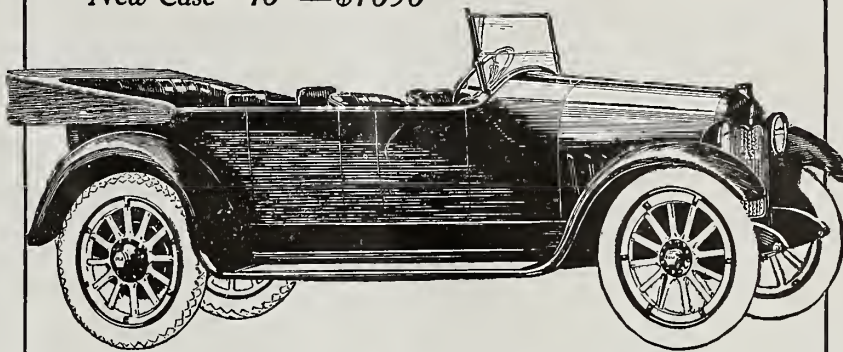
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(366)



# Peculiarities of the Destructive Plant Lice, or Aphids

By Dr. A. L. Melander, Professor of Entomology, Washington State College, Pullman

**D**ESTRUCTIVE though they are, the Plant Lice, or Aphids, show so many peculiarities in the course of their lives that we cannot help but marvel at their nature. Throughout the summer generation after generation is born alive from virgin females. To the student of heredity this phenomenon is more than interesting, for the successive generations are often widely unlike. Sometimes winged individuals are born of wingless mothers, and they in turn produce wingless offspring. Sometimes the color differs, sometimes the structure. From a practical standpoint the aphids are further remarkable in that some species change their diet during this alternation of generations, the summer broods acquiring food habits totally different from those for the remainder of the year.

Aphids breed rapidly. In a few weeks they are mature and then, except for the sexed final generation of the year, they reproduce living young without the necessity of mating and fertilization. This rapidity of development explains why aphids frequently become abundant to excess despite the usual sprayings. Huxley, the English scientist, once calculated that were a single plant louse to reproduce her full number of offspring and were they and all their descendents to live to old

age the amount of aphids resulting in one season would weigh ten billion pounds. This has been translated as about equivalent to the weight of the entire population of the United States. That such staggering amounts of plant lice fail to appear is due to unnatural death, coming not only through the agency of tiny wasp parasites, of lady-bird beetles or of Syrphus fly maggots, all of which greedily prey on plant lice, but also through such causes as wind and rain. However, it is sufficient to say that aphids are prolific.

The curious alternation of generations that occurs through the year can be illustrated by the life cycle of the Green Apple Aphis. The winter eggs, which are commonly located on the exposed bark of watersprouts and of the new growth, hatch when the buds are swelling. The tiny emerging lice are rather dark green in color and soon work into the opening buds. These individuals are all females, but are capable of reproducing the species by themselves, a phenomenon known as parthenogenesis, which is a Greek word meaning "virgin's birth." They are all wingless when mature, never lay eggs, but bring forth from three to twelve living young a day. When about a hundred young have been born the stem mother dies.

The lice of the second generation are paler in color than their parent. They, too, are parthenogenetic, viviparous females, and except for a rare individual now and then are likewise devoid of wings. Their offspring, the third generation, usually develop wings,

in which case they pass during their growth through a sort of pupa stage characterized by the possession of small wing-pads. This generation, whether winged or not, still comprises parthenogenetic, viviparous females. Winged individuals appear in diminishing numbers after midsummer. Their purpose in life is obviously to spread the species from tree to tree, and hence they are called "migrants."

The Green Apple Aphis spends its entire existence on apple trees, or more rarely on pear, hawthorn, quince or flowering crab. In the late fall some small lice are born, of a more yellowish color than the summer generations. These are the wingless males and females, the only sexed individuals of the year. After mating the males perish, while the females crawl out on the twigs to deposit their single egg and to die. Thus are produced the only eggs of the year whose dormancy exhibits Nature's splendid adaptation to tide a delicate insect through the rigors of winter.

Closely related to the Green Apple Aphis is the Rosy Apple Aphis. Like the other, this species also lives in the leaves, causing them to curl by injecting a poison into the growing leaf-tissue, but unlike the Green Aphis the Rosy Aphis confines its attacks mainly to the leaves around blossom clusters. The poison injected is very subtle and affects the young fruit, inhibiting its growth so that the tree develops a crop of "gall-apples." This stunted fruit varies in size according to the extent

Continued on page 41

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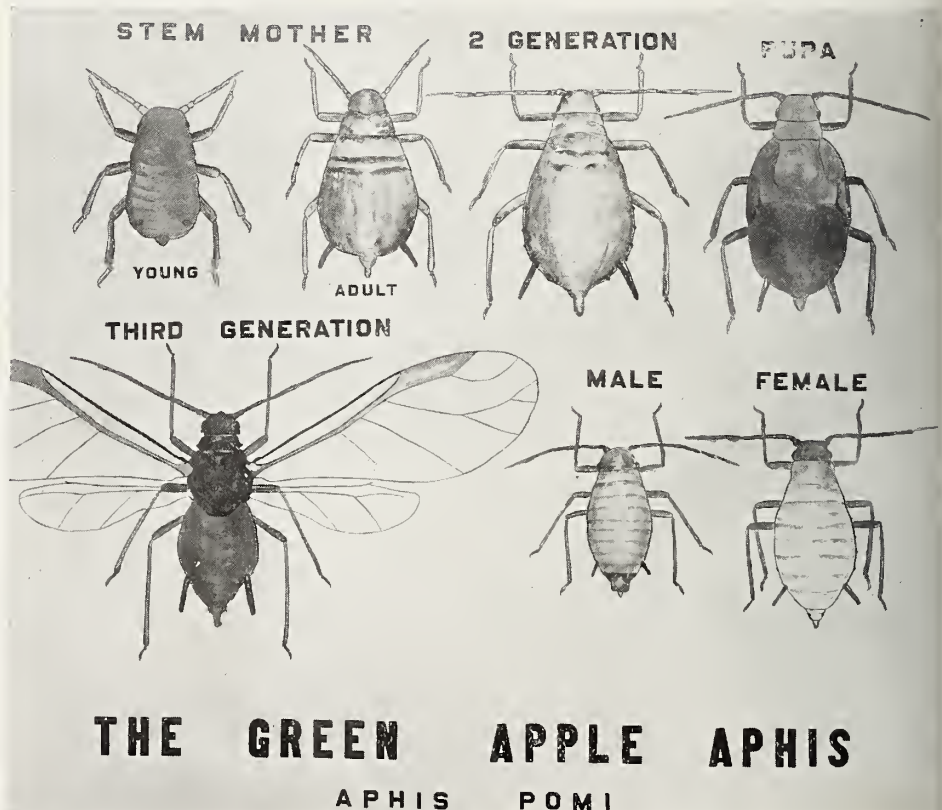
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**4 Compact and Sturdy**—Small enough for the orchard and powerful enough for the farm.

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**Easy Control**—Easiest of all Tractors to drive—Turns in its own length. **6**

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**Friction at a Minimum**—Twenty-five Hyatt Roller Bearings in each machine. **8**

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The Catalogue explains why—send for it.

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## Fruit Growers' Agency Incorporated

**P**RACTICALLY all growers' selling agencies in the Northwest have been brought together in a definite, harmonious plan of marketing procedure; all the past hopes and efforts of the growers for an ideal marketing system bid fair to be successfully consummated; all the repeated suggestions and advices of the business men, bankers, the press and others vitally interested in the welfare of the fruit industry to "get together" have been heeded. Briefly, this sums up the effect of the formation of the Fruit Growers' Agency at Spokane last Friday, after more than a year's

careful and incessant thought on the part of the growers, the selling agencies, and particularly the effective investigations and work of the United States Department of Agriculture. To place the fruit business upon a firm, sound basis was the object.

The movement does not mean a new selling organization. It does not mean a new shipping organization; does not contemplate additional expense to the grower. The Fruit Growers' Agency, as organized, is the get-together instrument of the growers and selling agencies for the common purpose of

mutual protection, and through its Spokane headquarters will be handled the details so essential, though incidental, to the successful handling and marketing of the crops. The Agency, as an organization, will perform no act whatsoever of selling. It will displace no existing shipping organization. The present selling agencies will continue to act independently in their dealings with the markets. But through the mutual organization thus formed by the growers and shippers, the centering of the best thoughts and minds in the industry, will be devoted to the adoption and carrying out of advanced practices in marketing, and such matters as the extension of trade develop-



ment in the world's markets. Substantially, confidence is expected to take the place of hostility in competitive conditions, and through that confidence, economy.

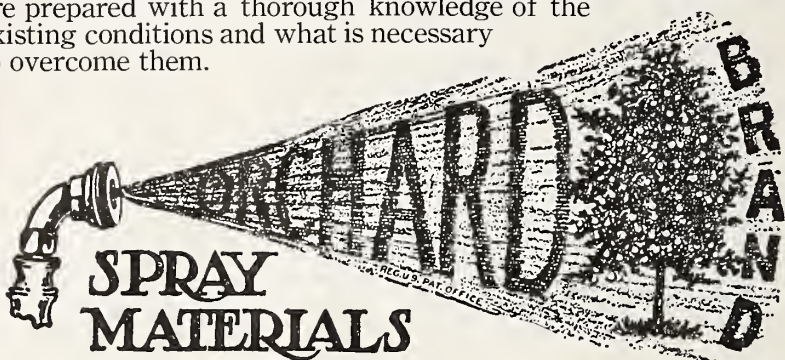
Up to date, the following organizations, which represent in the aggregate a total of probably seventy-five per cent of the soft fruit and apple tonnage of the Northwest, constitute the shippers' side of the Fruit Growers' Agency, and gives a fair idea of its great scope, bringing as it does that extent of tonnage under the orderly control of the associated growers:

- Apple Growers Association, Hood River, Oregon.
- Idaho-Oregon Fruit Growers' Association, Payette, Idaho.
- Montana Fruit Distributors, Hamilton, Montana.
- Northwestern Fruit Exchange, Seattle, Washington.
- North Pacific Fruit Distributors, Spokane, Washington.
- Richey & Gilbert, Toppenish, Washington.
- Sampson Fruit Company, North Yakima, Washington.
- Spokane Fruit Growers' Company, Spokane, Washington.
- Wenatchee North-Central Fruit Distributors, Wenatchee, Washington.
- Wenatchee Valley Fruit Growers' Association, Wenatchee, Washington.
- Wenatchee Produce Company, Wenatchee, Washington.
- Western Oregon Fruit Distributors, Portland, Oregon.
- Yakima County Horticultural Union, North Yakima, Washington.
- Yakima Valley Fruit Growers' Association, North Yakima, Washington.

It is made clear by the government expert that the Fruit Growers' Agency is formed for the specific purpose of providing the basis and the facilities whereby the selling agencies can carry out the provisions of the uniform contract between the growers and their individual selling agencies. In order to receive the benefits of the new plan it is not essential that the growers generally become members of the Agency. It is necessary, however, that they enter into the uniform contract with selling agents who are members of the Agency. The grower thereby becomes eligible to membership and may become an active or a passive member if he cares to do so. The board of control of the latter is equally divided between the individual growers and shippers. The respective powers of the growers in marketing conditions, and those of the shippers in production and assembling conditions, are thereby brought into common contact and discussion and the utmost facility is offered for a mutual handling of the problems arising from time to time in both the growing and marketing ends of the business. All principal districts in the Northwest are represented on the board of control of not less than eleven members, either by growers or selling-agency officials, one trustee being elected from each district, except that in the case of Wenatchee and Yakima two trustees will be active participants on the board. Other designated districts are: Southern Idaho, Spokane, Walla Walla, Hood River, Western Oregon and Montana, together with contiguous territories thereto.

Membership is divided in two classes. Active membership is open to all North-

THE control of Orchard Pests is no longer an experiment, but a scientific problem. **ORCHARD BRAND SPRAY MATERIALS** are prepared with a thorough knowledge of the existing conditions and what is necessary to overcome them.



Orchard Brand Arsenate of Lead only is the standard poison for the control of codling moth and similar insects. Now manufactured by an improved process which combines the ingredients so as to produce a soft, creamy paste which mixes readily with water.

Orchard Brand Atomic Sulphur, the best known remedy for the control of the mildew.

Orchard Brand Lime Sulphur Solution—a highly concentrated clear liquid free from sediment for late winter and early spring spraying on fruit trees.

Orchard Brand Bordeaux Mixture, properly balanced fungicide in paste form ready for immediate dilution in water.

Universal Dormant Soluble Oil is especially manufactured for use in the Pacific Northwest apple orchards, during the dormant season, where its effectiveness has been proven as a general clean-up spray to kill all species of scale insects, aphids, eggs, etc.

Write us, giving age, variety and kind of trees, together with a description of the pest you wish to control, and we will give you definite information regarding its control.

When ordering, state quantity and kind of material, or age and number of trees.

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## PEAR TREES FOR SALE

We offer fine thrifty stock at bottom prices.

We also have a few cherry and other trees left at clean-up prices.

Order today as we are nearly sold out.

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We are now located at our new plant.  
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*Lime Sulphur  
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**Oregon Arsenical Spray Co.**

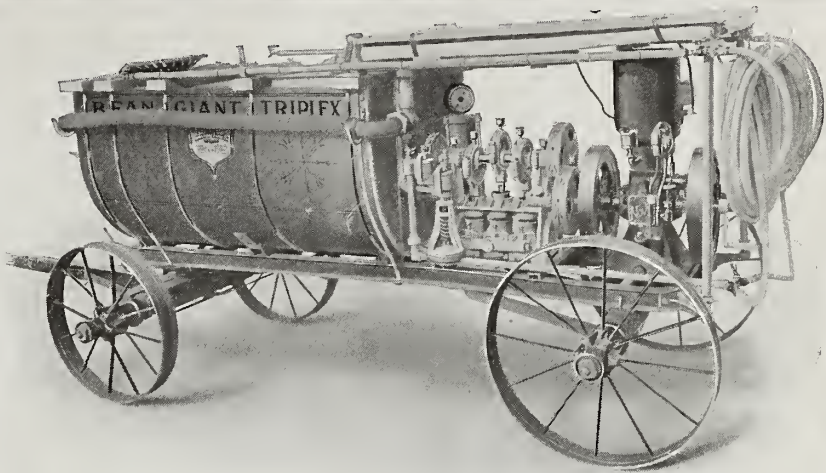
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western resident selling agencies having a tonnage of not less than an average of one hundred cars per season. Individual growers producing one or more carload quantities may likewise and under the same terms be active members. Under a corresponding tonnage condition, a passive membership is open to all local associations affiliated with selling agencies, as well as individual growers. Maintenance of the Fruit Growers' Agency will be borne by the shippers upon a tonnage pro-rata basis. Eligibility to membership is confined to certain specific features, namely, selling organizations must be bona fide Northwest resident bodies; they must be actual agents of the grower and market their output in his behalf; they must use the uniform contract exclusively. All other active and passive members must also be parties to and use exclusively that same contract. The uniform contract is the instrumentality about which the entire movement and organization is constructed.

The uniform contract illustrates the general scope of the entire plan. Its conditions, which are mandatory upon the selling organizations, constitute the principal great needs of the grower; incidentally they represent the very things the shippers have recognized as vital to the progress of marketing methods,—for example, the wider development of markets, the great need for a controllable and economical pio-



For Continuous, Dependable, Efficient Work

—get a Bean. It is the 42-centimeter gun in the fruit grower's fight against orchard pests—and it is pounding down the obstacles that stand in the way of bigger crops, better fruit and more profits. That's why the growers of the Northwest unite in their praise of

Bean Power Sprayers

The spraying season is on. There's no time for delay. We have a complete stock at several centrally located Northwest points and can make immediate delivery. You will make no mistake in choosing a Bean. It will do your work, do it right, and still be doing it long after cheaply built rigs would have been consigned to the scrap heap. There are scores of reasons why "The Bean is the Best"—let your dealer tell you or read them in our new catalog.

Send For Our New Complete Catalog No. 30.

Bean Spray Pump Co.

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**Sold For 6 H.P. Pulls 9 H.P.**

**GREATEST value I have ever offered.** All sizes pull from 30 to 50 per cent over factory rating. Sturdy and dependable; Built by experts; Lowest cost of operation.

**90 Days** in which to try this engine. All sizes, Kerosene or Gasoline, 2 to 22 H.P. Find out for yourself that WITTE engines are not "cheap" engines, but are high quality engines **priced low.** Use one on your farm—try it out thoroughly—and let me know your decision. All sizes less than \$17.50 per H.P.

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neering of the many foreign markets now unacquainted with Northwest fruits, as well as a steady and greatly enlarged distribution in Great Britain, Germany and other export countries. These latter have been handled under a series of almost insurmountable obstacles in the past, due to irregular and uncertain offerings and uncontrolled competition, but which can only be overcome through the employment of joint representatives directly representing the produce of the various districts. The uniform contract is thus the power wheel of the grower, his direct control over the marketing and distributing act; to the shipper it is the guide to actual practices as instructed by the grower. Jointly, the grower and marketer are thus in har-

mony in the aim to obtain the wisest and widest distribution with the greatest return at the least cost of operation.

The terms of the uniform contract are as follows:

In consideration of the mutual advantages to be derived herefrom, it is agreed between the parties to this contract as follows:

I. The grower shall have the exclusive right and authority to fix the price at which his products or any part thereof may be sold by the selling agent, but in event the price so fixed shall be higher than the best market price obtainable after offering the same, the selling agent shall in no wise be held responsible for failure to negotiate sales at such prices.

II. It shall be the duty of the agent to cooperate with all growers' resident selling agents who are members of the Fruit Growers' Agency, Incorporated, for the following purposes:

(a) To secure information as to crop conditions in order to determine the economic values of the varieties and grades.



# The Modern Farmer

uses Sherwin-Williams Dry-Powdered Insecticides and Fungicides because he finds them the best and cheapest form for all kinds of spraying. Easy to handle. Can't freeze or dry out. Sure death to pests without injury to foliage.

Arsenate of Lead } All in  
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Send for our Spraying Literature

**THE SHERWIN-WILLIAMS CO.**

Insecticide and Fungicide Makers  
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## He's Eating Up YOUR Money

**D**id you know the U. S. Government has shown that the ground squirrels on your place are collecting 34c from you every year for each acre of your cultivated land, in what they eat and destroy?

Furthermore, did you know that these little destroyers depreciate land values an average of \$2.74 per acre? Can you afford to pay the toll? Stop it. Get rid of these pests that eat your crops, destroy your trees and vines, and spoil your land. It's easy and inexpensive to get rid of them with Kilmol.

Kilmol is a liquid chemical that both asphyxiates and poisons squirrels, gophers, etc.—Kilmol "will kill 'em all."

Waste balls are saturated with Kilmol. One is placed in each burrow, then ignited. The gas quickly penetrates to every part of the tunnel.

The waste balls you get from us are better and cheaper than home-made. Write for full information about squirrel and gopher destruction, and also ask about improved United States Government formula of poisoned barley.



Will Kill 'Em All

It "gets" Mr. Squirrel or Mr. Gopher before he can escape. One application, costing less than one cent per burrow for Kilmol, invariably does the business—it's 100 per cent efficient. Results absolutely guaranteed or money refunded. Kilmol can also be used with U. S. Destructor—a machine invented by U. S. officials that forces Kilmol gas into burrows—Kilmol is used by Government, State and County officers.

Kilmol in the United States Destructor Gives 100% Efficiency. Invented by U. S. officials.



(b) To work in close harmony with growers with the aim of securing uniform methods in harvesting, grading, packing and the physical handling of the fruit from tree to car; and to secure a standardization and enforcement of the grading and inspection rules of the States of Oregon, Washington, Idaho and Montana.

(c) To agree upon a date after which no contracts for tonnage shall be entered into.

(d) To discuss in conference market conditions and experiences with various mediums used in the markets for the purpose of ascertaining the most efficient agencies and market outlets for the economical performance of their mutual contract.

(e) To secure improvement in transportation and storage service and conditions.

(f) To work out definite plans for the development of various domestic and Canadian markets, utilizing experienced men and the combined resources of the said agents.

(g) To develop foreign markets along the following lines:

(1) To conduct comprehensive foreign investigations for the purpose of knowing trade demands and making reliable trade connections.

(2) To see that the fruit is prepared for market so that the grade and pack may be in accordance with the best trade demands.

(3) To supervise the physical handling of the shipments through to final destination and to secure adequate insurance so that the hazards may be reduced.

(4) To secure capable foreign agents to conduct sales abroad.

(5) To expand old markets and develop new ones by direct contact and through the solicitation of special agents.

(6) To devise ways and means to safeguard and secure prompt collections.

(7) To secure adequate transportation facilities by underwriting steamship charters and promoting new fruit trade routes.

(h) To pool proceeds of sales and share pro rata any loss sustained in the development of new markets, according to the varieties and grades, over definite periods, so that profits and losses therefrom may be equalized.

(i) To secure the standardization of agents' accounting records, to the extent that all account sales issued by the said shipping agencies will be figured on the same basis and in such manner that they will be uniform, allowing true comparisons to be made by the grower between the services rendered and prices secured by the different agencies.

(j) To secure an annual audit of the sales records of the current season's business of said agents by firms of certified public accountants of recognized standing, the reports of these audits to be available to the growers not later than one month prior to the closing of the contract period for the next season.

(k) To make all possible legal and banking arrangements for the financing of the growers.

(l) Advancements shall in no case be made in such manner as to pass title of the fruit.

The entire plan of organization and details as ratified at the meeting of February 18th, was prepared and submitted by the Office of Markets, Department of Agriculture, in co-operation with the Office of Solicitor of that Department. It contemplates the most feasible and effective plan that can be devised in the formation of an organization of growers and shippers operating together to obtain the results that all marketing agencies and growers have been trying to reach. The activities of the government in behalf of the Northwest fruit industry are the results of their previous observations as well as pressure brought by growers, marketing agencies, bankers, chambers of commerce, and other sources throughout the Northwest for direct federal aid in the solving of the growers' problems. They emphasize the great progress made by the Department of Agriculture in developing a competent and constantly growing system dealing with marketing conditions, so long the aim of the Washington officials. By those thoroughly conversant with general conditions in co-operative effort among

Oregon Distributor  
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Dept. L Spokane



the producers of the nation, this is stated to be the most extensive and potential program that has been adopted in any section of the United States.

Articles of incorporation, constitution and by-laws were also ratified at the meeting, and the filing of the corporation articles arranged for. The Fruit Growers' Agency is being incorporated under the laws of the State of Washington as a non-profit, non-capital body. Further meetings are to be held at the Spokane office regularly, and in charge of an executive secretary, under the direction of the executive committee, will shortly become the prominent factors in Northwest fruit conditions. The government experts, C. E. Bassett, Clarence W. Moomaw, and W. H. Kerr of the Office of Markets, Department of Agriculture, under whose auspices the meeting was held, will visit every producing district in the Northwest in the interest of meeting and discussing all vital questions directly with the growers, and an extensive program of research work along different lines will be part of the additional investigations of the Department of Agriculture. Working committees of the Agency were appointed at the meeting, but the election of officers will not take place until the next regular meeting. The opening of the Spokane office will likewise be deferred until such time.

The I. H. C. Almanac for 1916 has just been issued by the International Harvester Company of Chicago, and can be obtained from them free upon request. The almanac is a magnificent book printed in colors, containing 48 pages, discussing in a very practical way many subjects of importance to the farmer and fruitgrower, such as feeding, silage, plans for home buildings, fuel for kerosene engines, weights and measures, information about handling stable manure, short treatises on proper tillage, statistics on dairying, prevention and cure for hog cholera, etc. In fact, the amount of information contained in this almanac makes it a sort of an abbreviated encyclopedia for the farmer.

In Walla Walla they have an organization called the Walla Walla Sprayers' Association, the purpose of the association being to spray orchards for fruitgrowers who are not prepared to do their own spraying. The scale of prices for the coming season is a charge of six cents per gallon for spraying where 500 gallons or more are necessary at a spraying. An organization of this kind in other districts would be very helpful to many fruitgrowers whose places are not sufficiently large to justify them in purchasing or owning the proper kind of an outfit. But an orchard has to be pretty small that does not justify the owner in owning a good spray outfit.

Cashmere fruitgrowers apparently have suffered from car shortage during the past year, as they have put in an urgent request for better service in the future.

#### Valuable Book Free

Every farmer who owns an engine or expects to buy one ought to know about engines—how to judge them, how to apply simple tests, how to figure exactly what an engine is worth. This interesting and valuable information is given in the free illustrated book, which will be sent without any obligation to any reader. Simply send name today to E. H. Witte, 188 S. Oakland Avenue, Kansas City, Mo.—Adv.

**WANTED! AN ASSISTANT** to Superintendent. Party should have knowledge of General Farming, Dairying and Horticulture. Special duties will be care of live stock, overseeing marketing of fruit and clerical work. Applicants should give age and state if married or single, names of former employers, length of time with each and work done while in their employ. Address W. H. Weber, Mosier, Ore.

## Scale—Scab—Mildew

These are the principal pests and diseases affecting the apple orchard

### LILLY'S Soluble Sulphur

Is the best spray for scale, mildew and scab. It has a proved record of five years. Effective, Economical, Convenient.

Note results obtained by—

Washington Station, using 20 lbs. to 100 gallons:  
Yakima Valley in 1913—99% scale killed.  
Yakima Valley in 1914—98% scale killed.  
Wenatchee Valley in 1915—98% scale killed.

Note results obtained by—

District Inspector at North Yakima in 1914 with 20 lbs. to 100 gallons, 99% scale killed.  
Again three tests at different strength in 1915:  
15 lbs. to 100 gallons—75% scale killed.  
20 lbs. to 100 gallons—96% scale killed.  
25 lbs. to 100 gallons—98% scale killed.

This is an indisputable scientific record.

100-lb. drum.....\$7.50  
10-lb. can.....1.25  
1-lb. can......20

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If You Want to Know How to Control SCALE, MILDREW and SCAB Send for our 1916 SPRAY BULLETIN It tells about the Best Spray and how Best to Spray

## WANTED

position as manager of orchard. Experienced in growing apples and pears and in general farming. Understand irrigation thoroughly. Will furnish references upon request. Address "Horticulturist," care "Better Fruit."

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Position as Horticulturist by practical expert with years of experience. College graduate. Can give very good recommendations. Address S. N. L., care of "Better Fruit."

## Nitrate of Soda

Write us. Free Literature for any fruit or crop.

**NITRATE AGENCIES CO., SEATTLE, WASHINGTON**  
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**Squirrels and Gophers.**—During the next few weeks these pests will become exceedingly active. Gophers frequently cause serious losses, especially in young orchards. There are many remedies, in addition to traps, in the way of poisons which can be used very successfully in exterminating both these pests. This is a subject fruitgrowers should investigate and prepare themselves with either traps or poisons which can be used in the runways and holes. Growers have lost as many as several hundred trees in a year from these pests which are worth several dollars apiece, according to the age. If they would take the pains to kill the gophers and squirrels they could save this loss.

**Inoculation for Legumes.**—A number of fruitgrowers throughout the West have been experimenting with the inoculation process and meeting with splendid results. Inoculation is now being extensively recommended by the Experiment Station at Pullman, Washington, for clover, alfalfa and vetch and various legumes. Frequently where the farmer has failed to get a good stand from lack of bacteria in his soil, by inoculating his seed he has been very successful in getting a good stand. Comparative tests show that where seed is inoculated the crop is much heavier.

We want the Grower to get Nitrate at a reasonable cost—learn of its general use—and make more money.

**Apple Estimates for 1915.**—According to the monthly Crop Report issued by the Secretary of Agriculture, the apple crop for 1915 was 76,676,000 barrels, and for 1914 84,400,000 barrels, which shows that the crop of 1915 was only about 10 per cent less than the crop of 1914. But gee whiz! what a difference in prices! It must be very evident to the thinker that the low prices for 1914 were not owing to the difference in quantity or overproduction, when there was only 10 per cent difference in quantity and almost 100 per cent difference in the prices in many districts.

**Apples on Cold Storage.**—According to the government reports on boxed apples on cold storage, February 1st, 1915, there were 3,441,132 boxes; February 1st, 1916, 2,574,960, almost one-third less in February, 1916, as compared with February last year. Therefore it looks very much as if the balance of the box-apple crop, if active movement is continued and prices made reasonable, should be cleaned up with comparative ease.

**Apple Exports.**—Apparently the exporting is falling off very extensively this year, as reports from many sources indicate that the quantity exported this year was probably less than one-half the tonnage exported last year.



# BETTER FRUIT

HOOD RIVER, OREGON

Official Organ of The Northwest Fruit Growers' Association  
A Monthly Illustrated Magazine Published in the  
Interest of Modern Fruit Growing and Marketing  
All Communications Should Be Addressed and Remittances  
Made Payable to

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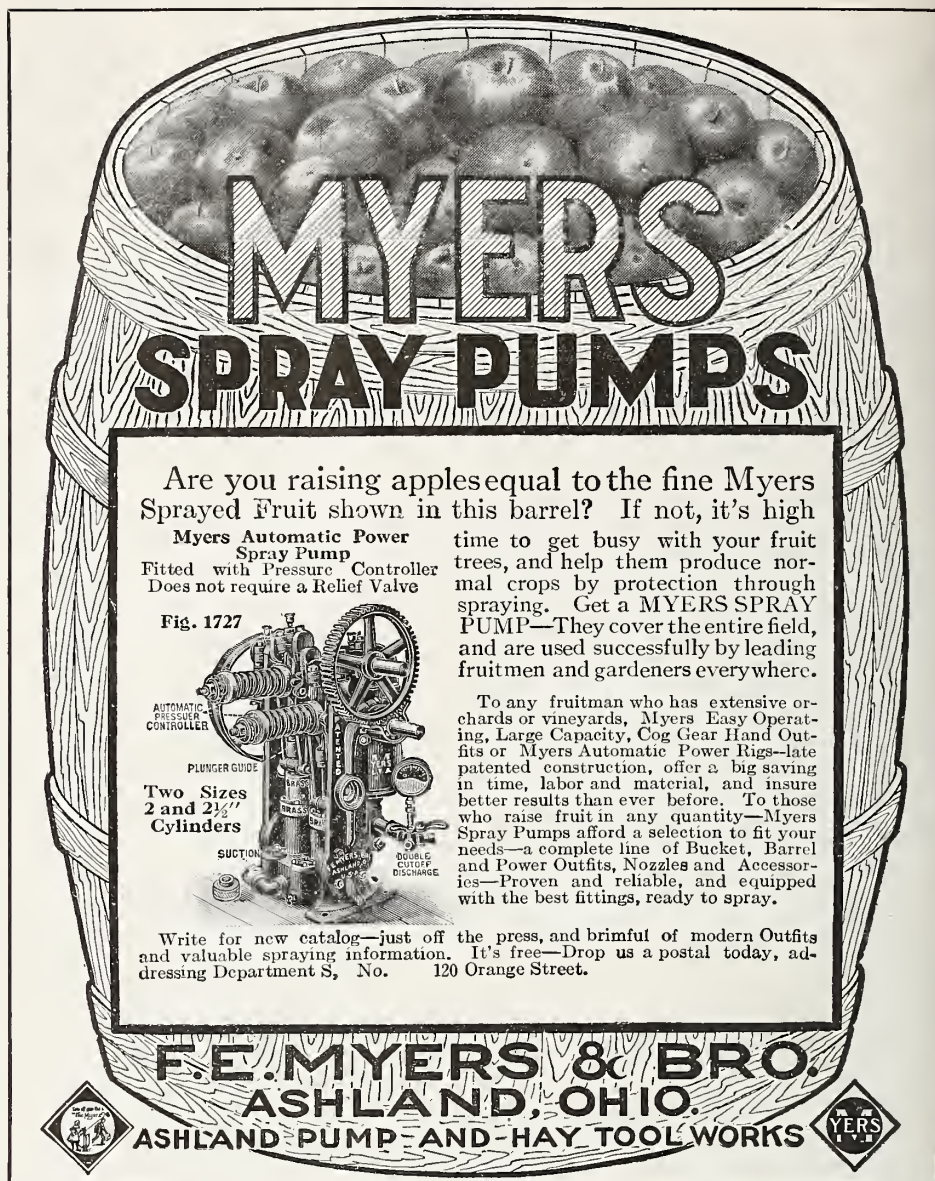
SUBSCRIPTION PRICE:

In the United States, \$1.00 per year in advance  
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ADVERTISING RATES ON APPLICATION

Entered as second-class matter December 27, 1906, at the  
Postoffice at Hood River, Oregon, under Act  
of Congress of March 3, 1879.

**Statement of Distribution of North-western Box Apples.**—No more important communication has ever been given the apple growers of the Northwest than is contained in the article on this subject appearing elsewhere in this edition. Your particular attention is called to the fact that the government sent representatives to gather information about the distribution of Northwestern apples for 1915. They asked the selling concerns, shippers and growers to co-operate, giving the distribution of all cars shipped; they also asked for the same information from the railroads. The railroads co-operated, showing the destination of 9,407 cars. The fruitgrowers did not, because their co-operation only reported 4,313 cars. But it must be stated that all the reliable shipping concerns of the Northwest co-operated by giving the information requested. Those who did not were independent shippers, consigners and small operators, and Eastern dealers. When the government becomes interested sufficiently to send representatives to help the apple industry of the Northwest, the government paying the expenses, it is very strange that the growers cannot see the wisdom of co-operating and furnishing the information requested. But nevertheless it is a fact they did not do so during the year 1915. As long as the growers will not co-operate among themselves or with the government there is no reason why they should blame anyone but themselves when they fail to receive proper values for their apples. The future is before us. Our success depends on ourselves. If we assist those who are trying to assist us—more particularly is meant in this case the Marketing Bureau connected with the United States government and




## MYERS SPRAY PUMPS

**Are you raising apples equal to the fine Myers Sprayed Fruit shown in this barrel? If not, it's high time to get busy with your fruit trees, and help them produce normal crops by protection through spraying. Get a MYERS SPRAY PUMP—They cover the entire field, and are used successfully by leading fruitmen and gardeners everywhere.**

**Myers Automatic Power Spray Pump**  
Fitted with Pressure Controller  
Does not require a Relief Valve

**Fig. 1727**



AUTOMATIC PRESSURE CONTROLLER  
PLUNGER GUIDE  
SUCTION  
DOUBLE CUTOFF DISCHARGE

**Two Sizes  
2 and 2½"  
Cylinders**

Write for new catalog—just off the press, and brimful of modern Outfits and valuable spraying information. It's free—Drop us a postal today, addressing Department S, No. 120 Orange Street.

### F. E. MYERS & BRO.

### ASHLAND, OHIO.

ASHLAND PUMP AND HAY TOOL WORKS

the associations and selling concerns that are handling our apple crop—there is every reason to assume that we apple growers can not only better ourselves but that in the near future we can dispose of our product for its market value, getting full market value by proper distribution and able salesmanship. But until the fruitgrowers are willing to do this, in fact until they do it, they cannot look for any increase in prices or betterment of present conditions except during occasional years when the crop is light, and therefore prices are good.

**Fruit Growers' Agency Incorporated.**  
This agency is the result of the excellent work done by the Bureau of Markets. It is to be noted that those who have handled the largest quantity of apples are the associations and selling concerns that are old and tried out, who are showing their approval by incorporating the agency and becoming affiliated as members, agreeing to act and follow the advice, instructions and requirements as laid down by the government officials.

Paragraph 1, "That every grower should have the exclusive right to fix

the prices," is the right kind of recognition of the apple grower ownership and a necessary arrangement on account of the trust laws.

Paragraph 2: (a) Good wisdom is shown by making it the duty of the selling concerns to co-operate for the purpose of securing crop conditions. (b) Good sense is also shown in the demand for closer harmony among the growers and selling concerns for the purpose of securing uniform methods in harvesting, grading and packing, which are absolutely necessary in order to standardize our present brands. (c) No better law was ever laid down than the one requiring a final date for contracts. (d) Shows an appreciation of conditions by recognizing the importance of conferences by the selling concerns on market conditions, experiences and mediums necessary in the sale and distribution of the crops. (e) Improvement in transportation, storage, etc., is another important matter that should never be lost sight of, but should always command continuous attention. (f) Calling for definite plans for the development of various domestic and foreign markets, whereby all selling concerns can pool for the development



of new outlets, is a privilege granted by the government that should be much appreciated. (g) Under the heads of one to seven, calling for a comprehensive foreign investigation; proper preparation of fruit in accordance with trade demands; supervision of the handling of shipments so they may reach their destination in good condition; conducting capable and reliable foreign sales agents; expanding old markets and developing new ones; devising ways and means and safeguarding and insuring prompt collections; securing adequate transportation facilities, are all subjects of vital importance to the fruitgrower.

If proper attention is given to these suggestions and co-operation of the selling concerns obtained there is no question but that improvements and betterments can be secured and better net results obtained, which is what all apple growers need. It is what they are asking for and demanding, therefore there is no excuse or reason why these suggestions given by the government, as outlined in this brief editorial and more completely expressed and fully explained in the article appearing elsewhere in this edition, should not be followed out carefully, conscientiously and satisfactorily in accordance with the advice given, by every selling concern, every apple grower of the entire Northwest. In addition, this movement should be supported by every bank and every business man of the Northwest whose business in any way depends on the fruit industry, either directly or indirectly.

Other particularly valuable features in connection with the plans outlined appear under the following sub-paragraphs: (h) To pool proceeds of sale and share pro rata any loss or profit that may occur in the development of new markets. (i) Referring to the standardizing of agents' accounting records is particularly important. (j) An annual audit of sales records is something every fruitgrower has been looking for and complaining because he did not get it. (k) Paragraph h, covering the financing of the apple crop, is a necessity which every apple grower realizes fully from past experience. (l) Referring to advancements is a needed reform, about protection to fruitgrowers, which they have not enjoyed in the past, as it does away with the evil of title passing where advancements are made.

## Yakima Valley Nursery Stock

NONE BETTER

Complete line of Fruit Trees,  
Small Fruits, Ornamentals, &c.  
Write for catalog and prices.

**YAKIMA & COLUMBIA RIVER NURSERY CO.**  
NORTH YAKIMA, WASH.

A few salesmen wanted.

## PROOF OF OUR LEADERSHIP

Elsewhere in this paper you will find factory advertisements of nationally known lines of orchard and farm implements—handled in the Northwest by us and our agents.

### Myers Spray Pumps and Power Sprayers

A line we have handled for years. We carry the Largest Stock of Spray Pumps and Fittings on the Coast.

### Light Draft Harrows

We assisted in the development of this wonderful harrow. Nothing Like It for Orchard Cultivation.

### Cutaway Harrow

We do not handle imitations. When you want a Double or Single Action Cutaway buy the Original Clark Harrow and you make a safe investment.

#### BIRDS OF A FEATHER FLOCK TOGETHER

Our entire line is built upon a quality basis. Get our prices on anything you need in Farm Implements and Supplies.

*Mitchell*  
**LEWIS & STAYER CO.**

Portland, Ore.  
and  
Spokane, Wn.

## If You Grow Fruit

and wish to attain quick and sturdy growth for your trees; if you want to increase the quantity and improve the quality of your fruit, you should use

### BEAVER BRAND ANIMAL FERTILIZER

"A Fertilizer for Every Soil"

Contains nitrogen, phosphoric acid and potash in the proper amount to replenish your soil with the plant food necessary to make steady growth of your trees certain and insure quality yields.

Place a trial order today.

Address

Box 101 for free folder

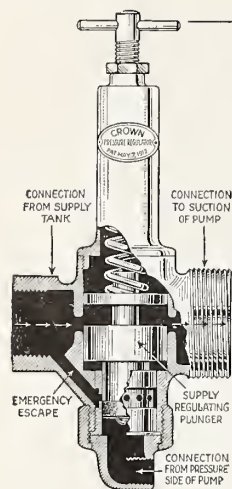


**UNION  
MEAT  
COMPANY**

NORTH PORTLAND  
OREGON.







## **"CROWN"** THE NAME THAT STANDS FOR SAFE, SIMPLE, EFFICIENT **PRESSURE REGULATION**

### **"Crown" Relief Valves and "Crown" Pressure Regulators**

**THE CROWN PRESSURE REGULATOR** (shown in cut) designed by the late J. D. Wallace, and originally called the "Wallace Pressure Regulator" was practically the "pressure regulator" designed for spraying machines. As indicated, it is placed in the suction line. Pressure acts against the bottom of the plunger which moves upward against reaction of spring, tending to throttle the suction. In practice, tests show that the plunger is constantly moving up and down, slightly closing or opening the suction in proportion to the amount of liquid used. Tests also show that this in turn affects the load on the engine. Thus power used is at all times proportioned to the liquid used. The **"CROWN"** is the simplest and most efficient regulator sold, and the only one based on this principle. See our ad in last issue on "RELIEF VALVES." Write for descriptive pamphlet.

**"Crown Relief Valve,"** postpaid, \$4.00.

**"Crown Pressure Regulator,"** postpaid, \$10.00

**CROWN SPECIALTY COMPANY, 1629 Washington Boulevard, Chicago, Illinois**

## Attention of Fruit Growers

**THE** 1914 apple crop brought mighty low prices. In the year 1915 apple growers were discouraged, many of them were short of money, and for these and other reasons too numerous to mention very poor work was done in the orchard. The fruit growers neglected their orchard work and devoted all their time to agitation meetings on the subject of marketing. The result was a heavy loss from scab, codling moth and various other pests and diseases, all due to neglect. The first step to making money in the orchard business is the production of a clean crop. The next step to success is obtaining a reasonable price. We have marketing concerns for that purpose. It is up to us to see that they do their work properly. But we ourselves must produce the clean crop. This cannot be done without proper equipment and proper materials, and therefore the editor desires to make a few comments on this subject, calling your attention to equipment and materials.

**Spray Outfits.**—You cannot do a good job of spraying unless you have a good power outfit to do it with. If you try to spray with an out-of-date outfit or worn-out outfit your results will be poor. If you depend on your neighbor or hire somebody else to do your spraying you will never get it done at just the right time. Therefore the editor advises every fruit grower who has not a first-class power outfit to purchase one.

**Codling Moth.**—Last year the damage from codling moth was about 30 per cent, due to a lack of spraying, poor spraying, omission of sprays, lack of thoroughness and poor material. Consequently the editor advises every grower to spray for codling moth in the most thorough manner possible, using the best materials obtainable.

**Scab.**—The loss from scab, sometimes called fungus, was excessive in all orchards last year, due principally to not spraying at the right time or using the right material at the right time. The editor advises every fruit grower to consult the experiment station of his state and obtain the latest information and advice on this subject. An instructive article appears in the February edition by Professor Bars of the Oregon Experiment Station, who has had a wide experience in controlling scab, which the editor believes to be a splendid program. It is not the intention in this paragraph to advise the fruit grower what to spray with or when to spray, but the editor desires mostly to call the attention of the fruit grower to the fact that there are several fungicides used for scab, among which are bordeaux, lime and sulphur, atomic sulphur and soluble

sulphur. Some fruit growers have used one of these fungicides with good success, while others have obtained splendid results with another. However, it must be borne in mind that at one time of the year some of these fungicides are dangerous, inasmuch as they are likely to cause a russetting, while others at certain times of the year are not sufficiently effective for scab. The editor believes that the best kind of a program for scab would be to use the right fungicide at the right time; that is, using the fungicide which would be the best control for scab at each particular season, with the least danger of russetting.

**Small Fruits.**—Every fruit grower in the country realizes the necessity of not being dependent upon a single crop. While there are many lines of diversity which the fruit grower can engage in along with orcharding, such as

dairying, hogs, truck gardening and bees, Professor Lewis very intelligently advises the fruit grower to diversify by growing more kinds of fruit instead of being dependent on the apple alone. Small fruits have always paid exceedingly well and therefore the attention of the fruit grower is called to some of the following small fruits which have been exceedingly profitable: Strawberries, blackberries, raspberries, loganberries, gooseberries and currants.

**Brown Aphis.**—This pest causes an immense loss every year in deformed apples, and, by the way, the loss is far greater than most fruit growers are aware. The most generally used spray for the control of aphis, and one which has given satisfactory results if applied at the right time, in the right way, is tobacco extract.

**Dairying.**—Since the growers have found that orchards suffer from clean cultivation, they have gone extensively into cover crops, sowing alfalfa and clover in the orchard, from

# Fire Blight Destroys Thousands of Trees

## FIRE BLIGHT OF THE APPLE IS SPREAD BY APHIS

APHIS CHECKS GROWTH OF TREES  
APHIS CAUSES LEAVES TO CURL  
APHIS DEFORMS FRUIT  
DESTROY APHIS WITH  
**"BLACK LEAF 40"**

**Guaranteed 40% Nicotine**

Your dealer will furnish you this effective insecticide in concentrated form—200 gallons of spray from the 2-lb. can costs \$2.50—1,000 gallons from the 10-lb. can costs \$10.75. If he will not supply you we will send it to you, express prepaid, upon receipt of price. Write for Free Bulletins to the address below.




# **"BLACK LEAF 40"**

**40% Nicotine**

**The KENTUCKY TOBACCO PRODUCT CO.**  
INCORPORATED  
**LOUISVILLE, KENTUCKY.**



which a good crop of hay can be produced each year. This will enable the fruit grower not only to keep enough cows to supply milk and butter for his own family use, but also give some an opportunity to take care of a few more and secure some extra income without extra expense. Therefore we suggest that you consult the experiment station in reference to a selection of stock, equipment, etc., that are necessary to conduct the dairying business successfully.

\* \* \*

**Spray Hose.**—Every fruit grower who has done much spraying has had the experience of finding one length of hose perhaps would last a season and even longer, while others would burst before the season was over. Therefore we advise the fruit growers to be particular in

## 25 Per Cent Reduction

ON ALL Apple, Pear, Peach, Prune, Plum, Cherry, Apricot, Nut, Shade and Ornamental Trees, Berry Bearing Plants, Flowering Shrubs, Vines, Hedge Plants, Roses, etc., etc.

**We Need Room in Our Nurseries for Spring Planting**

All Stock Clean, Healthy and Thrifty. Grown on virgin soil, two years from sage brush.

Most Complete Stock in the Northwest from which to select.

**All Stock True to Name**

Send today for Special Price List and Descriptive Catalog

**O. & F. Nursery Co.**

Box 217 K

Wapato, Wash.

## Windfall Apples and Culls Cost as Much to Grow as Sound Apples

Then why lose them? It is wholly unnecessary, because they can be turned into **Big Profits** by making them into **GOOD MARKETABLE CIDER** on Mount Gilead Hydraulic Cider Presses. Any size up to 400 barrels per day. We also make Cider Pasteurizers, Evaporators, Apple Butter Cookers, Vinegar Generators, Filters, etc.

Write Today for Catalog

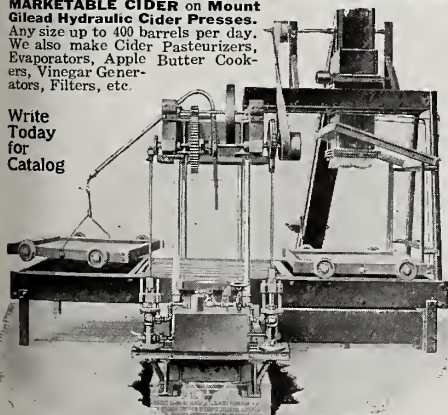


FIG. 639

THE HYDRAULIC PRESS MFG. CO.  
60 Lincoln Avenue, MT. GILEAD, OHIO

Pacific Coast Representatives

THE BERGER & CARTER CO.

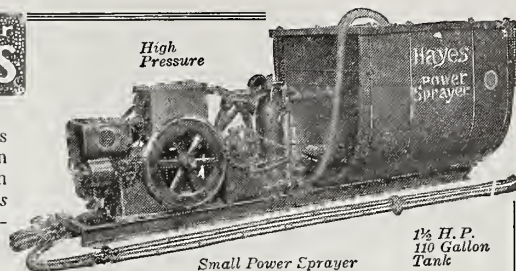
17th and Mississippi Sts. San Francisco, California

## Hand & Power HAYES SPRAYERS

**HIGH-PRESSURE** Spraying is plus spraying—it is 100% efficient. High Pressure completely atomizes the solution into a penetrating, fog-like mist that seeks out and adheres to every particle of foliage. It reaches protected pests that lurk in the innermost crevices of the bark, under bud scales and beneath the stamens of apple blossoms, and easily controls those on the outside surface. Mere "sprinkling" at low pressure will not give practical control.

Not only does High-Pressure Spraying insure a better quality of fruit but requires less solution, less time to apply, hence lessened cost. A High-Pressure Power Sprayer will pay you bigger dividends than any other orchard investment you can make.

HAYES Power Sprayers are tested to 500 lbs. and are guaranteed to develop 300 lbs. working pressure. They are built for con-



Small Power Sprayer

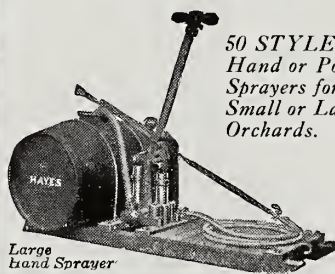
1½ H.P.  
110 Gallon Tank

stant operation at high pressure and enduring service. This not only requires the most thorough mechanical construction but the highest grade materials, hose and fittings.

**50 STYLES** Large and small Hand and Power Sprayers for orchards, field crops, shade trees, hops, poultry, disinfecting, painting, farm, home and garden use. Complete outfits or separate spray pumps, hose, nozzles, fittings, bamboo rods, etc.

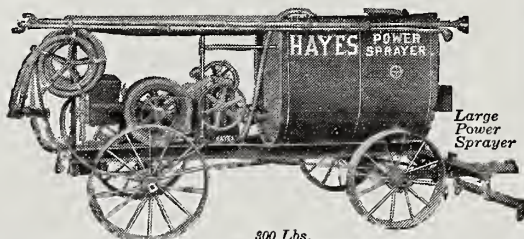
**WRITE!** Send postal for FREE BOOK 32 on High-Pressure Spraying and 64-page Catalog.

## HAYES PUMP & PLANTER CO., GALVA, ILLINOIS



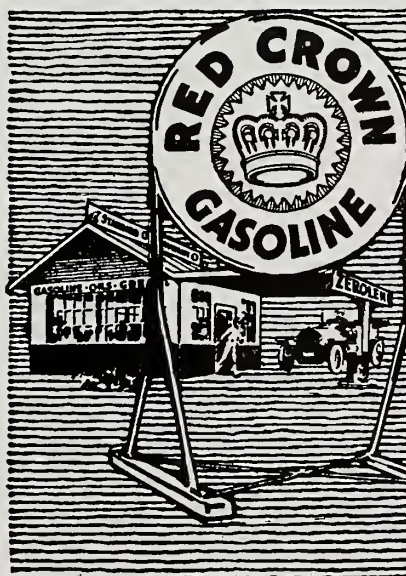
Large Hand Sprayer

50 STYLES  
Hand or Power  
Sprayers for  
Small or Large  
Orchards.



Large Power Sprayer

300 Lbs.  
Pressure Guaranteed



## The Guide to Pure Gasoline

Wherever you see this sign, in front of garages or at our SERVICE STATIONS, you know you can get Red Crown, the straight refinery gasoline — not a mixture.

**Standard Oil Company**  
[California]

Use  
**ZEROLENE**, the Standard Oil  
for Motor Cars

## 15,000 PEAR TREES Mostly Anjou and Bartlett Also Other Varieties

Extra fine trees, clean and well grown. Can make you very attractive prices. We have also a general line of nursery stock.

**CHRISTOPHER NURSERIES, Christopher, Washington**

their selection of spray hose. There are firms which make a specialty of manufacturing hose for spraying outfits and which will stand pressure without bursting and give a reasonable amount of wear. Be sure to get a good make of spray hose.

\* \* \*

**Labels.**—Consumers are today much more exacting and particularly more so than they

were a few years ago. They are demanding their supplies in sanitary packages, in which attractiveness is a big factor. Therefore we advise every fruit grower never to ship a box of apples without an attractive label on the end of the box.

\* \* \*

**Garden Seeds.**—Every fruit grower should raise a sufficient amount of garden stuff for



## The Spray That Sticks



# ADHESO

REG. U.S. PAT. OFF.

### Insecticide—Tonic—Fungicide

WHEN other spray materials fail to do their work, because rain washed them off, "ADHESO" STICKS, killing the Codling Moth and preventing the Scab, Apple Blotch and Bitter Rot, because IT STAYS WHERE IT IS NEEDED and does not wash off on the ground.

"ADHESO" GAVE 99% CLEAN FRUIT THIS YEAR, the worst in fifteen years for Codling Moth and Scab.

Write for details and means for making the STANDARD TEST FOR ADHESION.

"Triangle" Brand Arsenate of Lead

The reason why our Arsenate of Lead costs more than others, was shown this year. Ask the growers who used it. They DID NOT LOSE 50% to 75% by WORMY APPLES. It is not the COST PER POUND but RESULTS IN CLEAN FRUIT THAT COUNT.

**Ansbacher Insecticide Co., Inc.**

TRIANGLE BRAND

527 Fifth Ave., NEW YORK CITY

his home use, at least, and in addition to this there are many who are engaging in truck gardening to a moderate extent at least, and bringing in considerable extra money. Therefore "Better Fruit" advises fruit growers to give this matter consideration.

\* \* \*

**Harness.**—From now on until spring time, on account of bad weather conditions, fruit growers will be unable to work in the orchard to any great extent. Therefore this spare time should be devoted to putting every tool and every article on the ranch in first-class condition, preparatory for spring work. Every grower should wash and clean his harness, oil it and put it in first-class condition.

\* \* \*

**Spraying.**—Spraying is worse than working in the rain for getting wet, because all sprays are more or less nasty and spoil a suit of clothes very quickly. A good rubber overcoat or slicker is a great protection, both in the wet and to your clothes.

\* \* \*

**Orchard Cultivation.**—You cannot do a good job of cultivating unless you have the right kind of tools to do it with. There are a number of manufacturers making orchard implements. From these you can get circulars and price lists if there is anything you need in that line.

\* \* \*

**Walnuts.**—Walnuts have done exceedingly well in Willamette Valley, and from the few trees planted on the home grounds throughout Yakima and Wenatchee it is evident that they will succeed well in these two districts. Walnuts are paying the growers a splendid profit. Fruit growers should set a few walnut trees for home use at least, and there will be no trouble in disposing of the surplus, at least for some time to come, in your local towns and cities.

\* \* \*

**Tractors.**—A number of the larger orchardists have found that a tractor is a big factor in the orchard business, both in efficiency and economy. To all those who have good sized orchards we suggest they look into the matter of tractors.

\* \* \*

**Gasoline Engines.**—The gasoline engine has become a necessity on every farm. They are now used instead of horses and hand power for many purposes, like pumping water, sawing wood, feed cutting and spraying. There are a number of makes of gasoline engines. Be sure you purchase a good one that will save you money. With the use of gasoline on the farm, the quantity of gasoline used has increased very rapidly and very extensively. The editor knows that too many fruit growers buy their gasoline in five-gallon cans. A big saving may be made if you purchase gasoline in fifty-gallon drums.

\* \* \*

**Stump Pullers.**—A few years ago clearing land was very expensive and the job was poorly done, for the reason that it was both difficult to do and costly to get the stumps out of the ground with all of their roots. There are a number of good stump pullers now on the market, which not only enable the fruit grower and farmer to clear land a great deal quicker, but to do the job much better and at much less expense.

\* \* \*

**Pruning Shears.**—Pruning is one of the jobs that every fruit grower should be very particular to do well. To do this it requires a good pruning shears, one that will make clean cuts and close to the collar. Therefore we advise our fruit growers to obtain the best possible shears for this purpose. There are many good ones on the market.

\* \* \*

From time to time "Better Fruit" will continue its suggestions about equipment and methods and endeavor to put the fruit growers in touch with the best people in these respective lines. Prices have been constantly advancing in nearly all lines during the last few months and there is every reason to assume that prices will continue to advance for some time to come, and for how long no one can tell at present. Blue vitriol has gone from 7 to 20 cents per pound; there will be an advance in arsenate of lead. Anything that you may want to use this year is likely to go up in price, as nearly all prices are



## Deep Seedbeds Properly Prepared

—That's what you get when you use the deep-cutting, double-turning, leveling and compacting

### "Acme" Pulverizing Harrow

"The coulters do the work"—you should see them mix the soil, cut clods, weeds and trash and make the whole into a firm yet mellow seed-bed several inches deep. The "Acme" is simple, durable and easy to pull. Sizes 3 ft. to 17-1/2 ft. wide. Thousands in use. Send for booklet now.

**Duane H. Nash Inc.**

345 East Morrison St. No. 23	Portland Oregon 6 1/2 ft. wide
---------------------------------	-----------------------------------



## "Carco" KILLS MAGGOTS

A wonderfully successful spray for destroying maggots, grubs and worms which infest TURNIPS, RADISHES, BEETS, RUTABAGAS, CAULIFLOWER, CABBAGE, ONIONS, etc., and also recommended for combating crown borers in STRAWBERRIES.


This remedy has been tried out at Experiment Stations by Horticultural Inspectors and leading growers, who are highly pleased with results.

For Sale by All Leading Seed Houses on Pacific Coast. Ask for It.

Manufactured ONLY by

**Standard Chemical Company**  
TACOMA, WASHINGTON

(Send for Circular)



We can quote you surprisingly low prices on

# NATIONAL

## Wood Stave Pipe and Tanks

Now is the time to install irrigation and water systems. Write us today for our special service covering your particular problem.

Address Dept. J  
**National Tank & Pipe Co.**  
275 Oak Street  
PORTLAND, OREGON

## Dust Spraying Successful

Professor Donald Reddick of Cornell University, after extensive tests, has proved that dusting successfully controls the fungous diseases and insect pests of the apple orchard. The machine used by Professor Reddick in all his experiments and tests is the

### IDEAL POWER DUSTING OUTFIT

With it two men and a team can spray more trees thoroughly in one day than three men and a team can in five to ten days with liquid sprayers. A saving of time and labor of at least 60% to 75% in either small or large orchards.

Dust spraying is cheaper—quicker—easier. Anybody can do it and it takes less labor and equipment than any other known method.

FREE:—Write today for complete information regarding the tests and results obtained by Professor Reddick and the booklet "The Turn in the Road." Also descriptive catalog of dust sprayers. Learn more about this cheaper, more effective method of spraying. All the information is free and yours for the asking. Just send us a postcard today.

**DUST SPRAYER MFG. CO.**  
1415 St. Louis Ave., Kansas City, Mo.

Also manufacturers of Dust Sprayers for every purpose — both hand and power. Write for free descriptive circular for Hops, Vineyards, Potatoes, Cotton and Corn.




## Bastian Sectional Pruners

Compound Leverage. Superior to all other Pruners for Speed and Durability. Three Pruners in One. Can use 6-foot for young trees; two minutes to add 3-foot section for a 9-foot pruner; if large trees add last section; you have then a 12-foot Pruner, price \$2.25.

If not in stock by your dealer, mail us \$2.25 and we'll deliver your Pruner at your postoffice from nearest stock.

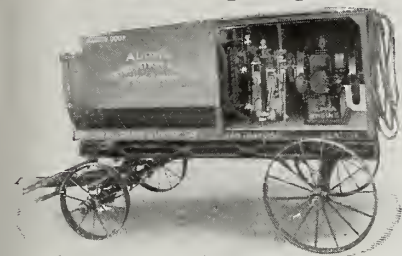
We also have all lengths of One-Piece Bastian Pruners, Shears and Pickers, Orchard Ladders, etc. Prices on application.

**Northwest Fence and Supply Company**

Exclusive Distributors for Bastian Pruning Tools  
372-374 E. Oak St., Portland, Ore.



## The Alpha Automatic Power Sprayer



FITTED WITH

### The Alpha Automatic Pressure Governor

**ELIMINATES** unnecessary wear and tear on both the engine and the pump.

**THE PUMP STOPS** when nozzles are closed. No liquid being pumped except it is forced through the nozzles.

**NO RELIEF VALVE** or diaphragm for the spray material to corrode and get out of order.

**THE AUTOMATIC PRESSURE GOVERNOR** is a simple arrangement of a combined lever and spring on each plunger connecting rod, which, when the pressure reaches a predetermined limit, automatically discontinues the operation of the pump without interrupting the driving power, again permitting it to resume operation when the pressure falls below the point at which it has been set.

**THIS INSURES SAFETY**, secures uniform pressure and eliminates unnecessary wear (no liquid pumped except it passes through the nozzles). The pressure relief is not dependent on the operation of a sluggish or defective relief valve, but is positive and mechanical, thus making it impossible to run the pressure up to the danger point.

**BUILT IN ALL SIZES** from a 2x3-inch pump and a 150-gallon tank to a 2½x3-inch pump and a 200-gallon tank. (Either Duplex or Triplex.)

Send for catalog and prices.

**De Laval Dairy Supply Co.**

SAN FRANCISCO

SEATTLE

Everything for the Dairy

# Walnuts Are Dollars

*Plant a Walnut Grove*

that will grow into Dollars while you sleep. The Vrooman Franquette bears at 3 years and sells for 25 cents per pound, is smaller than an apple and sells for more money. Get in with the tide and get rich. At 40 feet apart, it takes only 28 trees to the acre. Is cheaper than an apple orchard to plant, and makes your land more valuable.

True Vrooman Franquette Walnut Trees at Bargain Prices, at

**MIRA-MONTE NURSERY**

SAN JOSE, CALIFORNIA

steadily increasing. Therefore the fruit grower who is in need of anything, or will be in need, will do well to purchase the quantity he feels sure he will use early in the season, taking advantage of the present prices, before any further advance occurs.

### Original Reflections by the Editor

The man who succeeds in the world is the one who pays attention to business.

"The early bird catches the worm." In apple growing the early spray catches the worm.

Raising fruit is a business requiring business methods, system, efficiency and economy.

"A dollar, a dollar, a ten o'clock scholar," will never succeed in apple growing.

The worm hole in your neighbor's apple looks twice as large as yours.

If you know when you know and know when you don't know, you have learned a big lesson.

Every one of the associations could get splendid prices for apples if "the other fellows" did not "cut prices."

Popularity, demand and continued demand for a brand can only be obtained by making it uniformly good and continuing to do so.

Who is the boss? You or the grader? If you are the boss, don't blame the grader if your grade is not up to requirements.

Don't be a quitter—General Grant won the Civil War because he did not know when he was licked.

If more growers hauled more loads of apples to the vinegar factory, we apple growers would make more money.

The apple grower cannot afford to stove-pipe his box any more than he can afford to wear a stove-pipe on his head.

"Did you ever see a purple cow? No, I never saw a purple cow, but I am sure I'd rather see one than be one." Did you ever see an apple grower who couldn't sell his apples better than the other fellow? No, I never saw one, but I am sure I'd rather see one than be one.

In the apple business, there is only one thing which is certain; that is, Uncertainty.

"Here comes the bogey man; if you don't look out he'll catch you." In the fruit business, there are a lot of bogey men,—codling moth, scale, scab, etc. Look out or they will catch you in 1916.

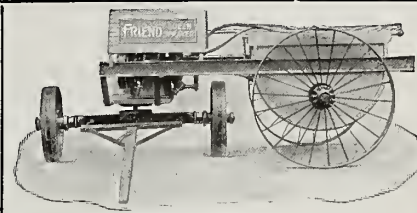
"United we stand, divided we fall." The language of the illustrious patriot, Patrick Henry, is a lesson the fruitgrowers must learn.

Don't kick. Any darned fool can do that. A mule is a kicker; don't be a mule. Kicking is destructive, not constructive.

What the fruit industry needs is constructive, not destructive, work.

### A Serious Error

Farmers make a very serious mistake in failing to destroy the squirrel, gopher and prairie dog pests at the proper time. In using treated grain as a destroyer of rodent pests it should be borne in mind that the creatures are not grain eaters except and only at the time they awaken from their long winter's sleep. With the first real breath of spring they awaken, and, ravenous for food, will quickly take the poisoned grain. At this time the poison is trebly effective by reason of their famished condition. As soon, however, as the succulent grass roots appear the effectiveness of the dry food decreases, for the pests divide their attention, and later ignore the grain entirely.



"FRIEND" QUEEN

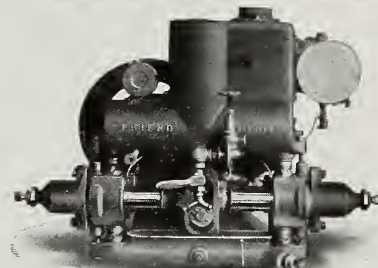
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Drive up and back the same row if you want to—turns short. Low center of gravity can't overturn. High pressure Motor-Pump—easy of access.

The great California and Northwest favorite. The most practical and efficient power sprayer on earth. Hundreds in use. Backed by "FRIEND" reputation.

"Have used my QUEEN three years. If I were to buy fifty power sprayers all would be 'FRIEND' QUEEN." So says A. J. Service, of Youngstown, N. Y., where last year \$3,000 "FRIEND" Power Sprayers were sold. Sales this year already far in excess and will double.

"FRIEND" is the dealers favorite.



"FRIEND" MOTOR-PUMP.

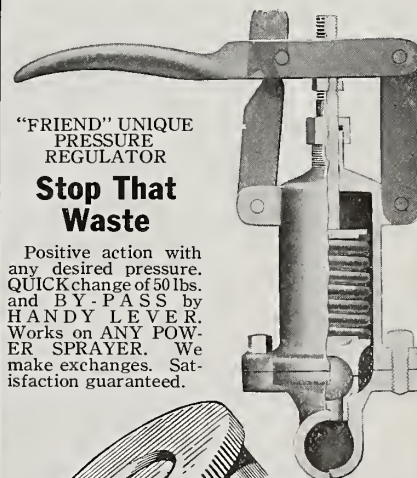
### A Money Maker

Don't waste another minute in the orchard with that heavy, cumbersome, troublesome engine and pump, when you can

### Equip YOUR Sprayer

with this HIGH PRESSURE pumping unit and Spray as You Never Sprayed.

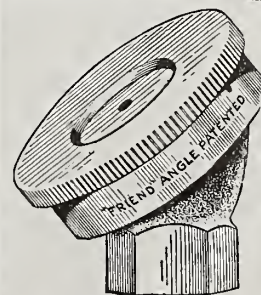
**FEATURES:** AUTO type motor in SOLID, COMPACT unit with HIGH PRESSURE plunger pump having QUICK detachable valve seats, QUICK accessible and adjustable packing, UNIQUE pressure regulator. Motor and Pump now have new simplified automatic oiling system. SCHEBLER carburetor, HIGH CLASS, built to a scale throughout. DIRECT connected to "FRIEND" propeller agitator in your own tank. Motor-pumps made in three sizes. Thousands in use on celebrated "FRIEND" outfits. We make exchanges. Tell what you have and want.



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"Friend" Mfg. Co., Gasport, N. Y.



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"Pride of Multnomah" potato won first prize at the San Francisco Fair for the best acre of potatoes grown in California. Another evidence of Oregon's agricultural supremacy is a letter and a photograph just received by the Portland Seed Company of Portland from the owners of the Boa Vista Ranch at Placerville, California. The photograph shows a corner of the acre of potatoes which won first prize in the state competition for the best acre of potatoes grown in California.

Mr. E. H. Phreaner, one of the owners of the Boa Vista Ranch, writes: "We are very pleased with the results obtained from the seed ("Pride of Multnomah" and "Snow") and will be in the market for several cars of seed potatoes. Have just received word that our exhibit of

potatoes at the Panama-Pacific International Exposition won the grand prize."

Boa Vista Ranch also won the competition for the best acre of potatoes—790 bushels of clean, healthy stock: "Pride of Multnomah." The "Pride of Multnomah" is one of the standard varieties of potatoes grown in Oregon. It has been grown in Oregon for seven years, and many experts regard it as in every way the best potato for Western Oregon. It has been shipped to all parts of the United States for seed purposes, and only excellent reports have been received. Its signal honors won in California now give it official recognition as the very head of the list. This potato is well known among most Oregon growers, and is popular because of its heavy yielding qualities,

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Our organization has expended sixteen long years of strenuous labor and around one million dollars in building up an equipment, the benefits of which you can get for a very trifling fee, which will permit you to do your business your own way—consign, sell on track, f.o.b. or customary terms of draft on B/L—do it any way you want to, yet do it safely by avoiding undesirable traders of all classes who are trying to secure contracts for your tonnage. Let them wait until fall. They will be glad to contract with you then. On the other hand, you may be able, by that time, to do your own business.

Send for our handsome 14-page Photo-Calendar, which contains extracts from Trading rules, grades and law of commerce that appear in the big Blue Book. It is valuable from an educational and reference view-point and will cost you nothing. When you send for it, please tell us how you are situated, that we may be able to tell you exactly what special features of our different forms of service will particularly apply to your requirements.

## Produce Reporter Company

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its uniformity and its fine grain. It is an ideal baking and boiling potato. It is also famous for its keeping qualities.

The Portland Seed Company, who are the producers of this splendid variety, are certainly to be congratulated. The State of Oregon won practically all the agricultural honors at the Panama-Pacific Exposition. This is just another demonstration of Northwestern superiority, which we at home are the last to realize.

The Board of Directors of the Milton Fruit Growers' Co-Operative Union executed a contract for handling their 1916 crop through the Northwestern Fruit Exchange. This is one of the old associations of the Northwest that has marketed in various ways before, selling direct, selling to individual buyers and also through the Distributors. The association puts up a pack of prunes which have won a splendid reputation for their quality.

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**The Dow Chemical Company, Midland, Michigan, U.S.A.**

## Nitrogen and Apples—Nitrogen A Stimulant

By Professor R. W. Allen, Experiment Station, Corvallis, Oregon

A SERIES of experiments were started in February, 1914, in the Hood River Valley to determine the comparative value of different elements of soil fertility upon the vigor of growth and productivity of fruit trees that had been kept continuously under clean culture since the time of planting. As the land was practically devoid of nitrogen and organic matter, the medium in which most of the soil nitrogen is to be found, a considerable portion of the work was devoted to tests of the value of nitrogen. This element was applied in various ways. A type of soil known as Hood Silt, which predominates upon the east side of the valley, was chosen for the work. The orchards had been continuously

clean cultivated since planting. The trees were of the Spitzenberg variety about 16 years of age. The plats included twenty trees each and were selected under the most nearly uniform conditions possible. The experiment in one orchard was a duplicate of the work conducted in the other except that a small amount of caustic soda was mixed in the nitrate solution applied to one and an equal quantity of caustic potash to the other. The first season, 1914, the applications were not all made at the same time. As a result it was observed that the earliest applications, which were made March 17, exerted a marked influence upon the vigor of the trees throughout the season, while the later

applications, some of which were made May 7 and 19, did not appear to affect the trees until near the close of the growing season. The work was re-

TABLE 1—Showing the set of fruit and yield of fruit, its size, the length and width of terminal growth, and size of leaves on check plat and plats fertilized with nitrate of soda.

Treatment of Plats	Plat 1	Plat 2	Plat 3	Plat 4
	Check Plat, Clean Culture for 18 Years	Nitrate Soda Solution Sprayed Onto Trees, Excess Fell to Ground	Nitrate Soda Solution Put on Ground	Nitrate Soda Crystals Spread on Ground
Nitrate applied 1914, gallons.....	None	6¾	6¾	6¾
Nitrate applied 1915, gallons.....	None	6¾	6¾	6¾
Amount nitrogen applied each year, lbs.....	None	1.08	1.08	1.08
Total nitrogen applied per tree, lbs.....	None	2.16	2.16	2.16
Total nitrogen applied per acre, lbs.....	None	70.	70.	70.
Number of blossom twigs counted.....	483	890	542	791
Per cent fruit set on counted twigs—				
June 4.....	35.3	69.6	68.0	82.6
September 30.....	16.4	37.3	30.7	34.6
* Average yield of note trees, loose boxes.....	3.75	19.	21.5	17.
Average yield per tree, loose boxes.....	.9	10.09	9.97	10.01
Size of fruit—				
175-150 per box, per cent.....	76.24	24.61	22.64	8.28
138-112 per box, per cent.....	18.32	41.87	29.13	24.71
100 per box and larger, per cent.....	5.43	33.52	48.23	68.10
Average length of terminal growth—				
1913, inches.....	6.7	5.	4.25	6.15
1914, inches.....	5.3	7.8	4.50	5.80
1915, inches.....	8.0	14.8	16.20	11.00
† Diameter of terminal growth.....	.172	....	....	.224
Size of leaves—				
Length, inches.....	2.25	2.8	2.2	2.75
Width, inches.....	1.35	1.65	1.5	1.60
* Trees with heavy set of blossoms were selected for this determination to render conditions as nearly uniform as possible.				
† Measured two inches above the base.				
‡ Pounds.				

TABLE 2—Showing comparative length of terminal growth and size of foliage of trees sprayed with nitrate solution over canvas and of tree liberally sprayed with the same solution on ground and tree.

Treatment of Tree	Length Terminal Growth, Inches				Diam. Termi- nal Growth, Inches, 1915			Size of Foliage, 1915	
	1911	1912	1913	1914	1915	1915	Length	Width	
Check trees, no fertilizer—average of two trees.....	....	....	6.7	5.35	8.55	.18	2.25	1.35	
Nitrate of soda, one pound to one gallon, sprayed on tree and excess kept off ground—two trees.....	11.	8.75	6.0	3.85	3.75	.13	2.32	1.46	
Very weak tree liberally sprayed with nitrate solution on tree and soil....	14.6	10.3	4.8	2.2	15.	.20	2.40	1.5	
Average of nitrate plats (2, 3, 4).....	....	....	5.13	6.01	14.	.224	2.58	1.58	

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## Old Dutch



peated in 1915, all applications being made at the same time, March 13 and 19 respectively, upon the two orchards. An additional plat was added to the experiment this season, designed to strengthen the work in determining if there is a perceptible invigorating influence upon the tree resulting from applying nitrate of soda to the branches and preventing its reaching the roots upon falling to the ground.

From the long-continued practice of clean culture in the orchards in the valley has resulted a seriously depleted supply of organic matter and nitrogen in the soil. With the loss of organic matter and increase in size and demand of the trees, drouth as well as shortage of nitrogen has contributed to the serious weakening of many fruit trees. This process had advanced to such an extent in some of the older and more persistently cultivated orchards that the trees had for some time been very yellow in appearance, weak and unproductive. A heavy crop of blossoms, that were weak in character and much under normal size, usually appeared each spring, but only a small number were able to develop and produce fruit. Although the trees were known to be badly in need of nitrogen as a constituent of the soil, it was decided, upon taking up fertilizer work, to find if the methods of spraying trees with nitrogen reported by Ballard and Volck as having increased production were of practical and economic value for the conditions existing in the Hood River Valley. For this purpose it was necessary to determine if the presence of nitrate of soda upon the branches exerted a beneficial influence, or if the result came entirely from the excess of the spray which fell to the ground, conveying its nitrogen to the roots of the trees. It was for this purpose that nitrate of soda was applied to the trees and ground in the manner described above.

As space will not permit all the important data being given for both experiments, from which very similar results were derived, only the one giving the most striking results will be discussed. The plats were treated as follows: (1) Check plat, no fertilizer. (2) Nitrate of soda, 1 pound per gallon of water, applied to the tree in form of spray, the excess being allowed to fall to the ground. (3) Same solution as applied to the trees in No. 2 applied to the ground about the trees. (4) Nitrate of soda crystals applied to the ground about the trees and worked in with the spring cultivation.

The nitrate solution applied to plats two and three was made up by dissolving 135 pounds nitrate of soda in as many gallons of water. To this solution was added 19 pounds of caustic soda. This quantity of spray was applied to each plat, giving 6¾ gallons of the liquid and as many pounds of nitrate of soda to each tree. To plat four was applied 135 pounds nitrate of soda, an equal quantity per tree. This application gave to each of the trees 1.08 pounds of nitrogen, which is

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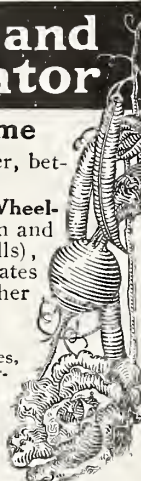
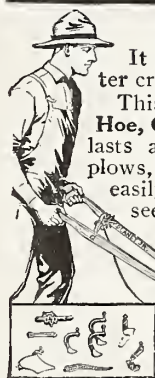
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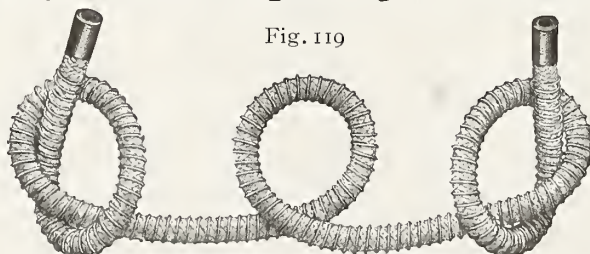


Fig. 119



equivalent to 70 to 75 pounds per acre. Results derived from the first year of this work show plainly that all plats receiving nitrogen, whether it were applied to the tree in the form of a spray, or to the ground in liquid or crystalline form, were much benefited by it. No appreciable difference could be noted in the vigor of the trees and yield of fruit that could be attributed to the manner in which the nitrogen was applied. All the fertilized trees were green and vigorous, yielded heavily and presented a much more robust appearance than the untreated check plat, which was in as good condition as the others before the experiment was begun.

As the treatment of trees described above is not such as will prove conclusively that the nitrogen lodging upon the aerial part of the trees is of no appreciable value as a fertilizer, or invigorating agent, a fifth plat was added in 1915. The purpose of this part of the experiment was to find if the small amount of nitrogeen that could be kept

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on the surface of the tree did in any way affect its growth. In order to make this determination a large, heavy canvas was placed upon the ground to prevent all the liquid which fell during the operation of spraying from getting to the roots. Owing to there being insufficient number of trees in the orchard which have not been influenced by the past year's work for a full plat a smaller number had to be taken for this determination. Five trees were sprayed in this manner, and as there was a quantity of the solution, which was the same as applied to plats two and three remaining, a tree that appeared to be the weakest and most devitalized in the vicinity was thoroughly sprayed, and the ground about it saturated. Approximately ten gallons of the spray were applied to the tree in this manner.

The results derived from this experiment in 1915, its second year, are much more marked than those obtained in 1914. A careful determination of the number of twigs producing blossoms that retained at least one fruit at thinning time and at picking time (See Table 1) shows a very marked influence to have resulted from the use of nitrogen. The manner in which the nitrogen was applied appears to have no relation to the amount of fruit retained by blossom-bearing twigs. Approximately half as many twigs retained fruit at full maturity as carried it until the first of June, although at the earlier date many twigs upon the fertilized plats carried more than one fruit, while only a small number carried more than one through the entire season. The percentage of loss of fruit from twigs on all plats between June



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FRED EBERLE, Manager

NORTH YAKIMA, WASHINGTON

and September, inclusive, was very similar. The trees upon which these determinations were made were not thinned.

The average yield of fruit per tree for plats 2, 3 and 4, which received equal quantities of nitrogen during the two years, was approximately the same, being 10.09, 9.97 and 10.01 boxes respectively. The check plat yielded .9 of a box per tree. In size of fruit there is not so close a relation between the nitrate plats. The largest apples were produced by the plat receiving the crystals, next in size by the plat having the nitrate solution applied to the ground and the smallest apples of the fertilized plats came from the sprayed trees. From the table (No. 1) it will be seen that a large portion of the apples, an average of 50 per cent are larger than are desirable for marketing, while 76 per cent of the apples from the check plat are equally as undesirable on account of being too small. The fruit from the check plat was more uniformly colored than from either of those receiving fertilizer, although the highly-colored apples from the latter were much brighter and more easily polished than the ones produced upon the check plat. Two hundred apples are being kept from the nitrate plats and check plat to determine their relative keeping qualities in cool storage.

The terminal growth of branches upon the nitrate plats have more than doubled. It is also shown that an increase has taken place in the terminal growth of trees in the check plat during 1915. This is doubtless due to the influence of irrigation which was applied to this orchard for the first time, the result being more readily apparent upon this than on the more vigorous-growing plats, Table 1. The size of the foliage on the fertilized plats is greater than that on the check, although the difference in size is by no means as pronounced as is the difference in color. Throughout the entire season all the trees receiving nitrogen were very dark green and vigorous in

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appearance, while the others were yellowish and sickly.

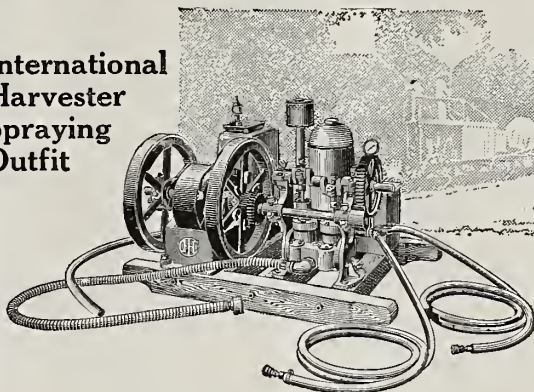
So great was the difference in the color in this orchard that the fertilized plats could be seen from a great distance. There was also a very marked difference in the attitude of the trees. The foliage and crop of the check-plat trees was so light that the branches stood up as in winter and were no barrier to people and teams passing beneath, while the branches of the fertilized trees were so weighted down with foliage and fruit that it was difficult to get through, and a team could only be taken between the trees in a very few places. Clean cultivation was continued in this orchard in 1914, but clover and alfalfa was planted in 1915 and irrigation water applied for the first time. The factor of irrigation has had but little apparent influence upon the comparative results, as it was applied uniformly to all the plats except No. 5, which, by virtue of its shorter duration, does not enter into this comparison.

Plat five was fertilized at the same time as the others, March 13. Although the weather was cloudy and threatening there was not sufficient precipitation to cause the nitrate to be washed from the branches to the ground for a number of days after it was applied. The land about these trees was cultivated in the spring, after which it was left unstirred. It was irrigated once very lightly, one furrow to the row, and the water allowed to run but a short time. The vitality of these trees had been so far reduced by drouth and starvation that blossoms were not produced in sufficient quantity to permit a determination of the set of fruit being made. The comparative effects of the nitrate spray applied to the tree alone and to the tree and ground about it are very pronounced. Table 2 shows the comparative vigor of the check-plat trees, those having the aerial parts treated with nitrate solution, the one to the top and soil of which the nitrate was applied, and those fertilized for two years with nitrate of soda, as indicated by the length and thickness of terminal growth and length and width of foliage.

From this it can be seen that the growth of the sprayed trees is much shorter than that of the check trees which received no fertilizer, but more water. It is much less than that of the tree heavily fertilized once, which is similar in growth to those receiving a smaller amount of nitrogen each year for a two-year period, and more water this year than the other. There is not

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so striking a difference in the size of the foliage, however,—that on the fertilized trees is largest. The color and general appearance of foliage on these respective areas is quite pronounced. The tree fertilized but one year presents as vigorous an appearance as those that have been treated longer, and those that received the nitrate on the branches alone are not perceptibly more vigorous than the check trees that have received no treatment—in fact they are less thrifty.

All the trees to which nitrate of soda was applied in 1914, at the rate of 6½ pounds, appeared to have been returned to full normal vigor. The second application, as is indicated by a heavy wood growth in addition to the production of a heavy crop of fruit in 1915, shows that one pound of nitrogen each year is too large an application for each tree. Fully one pound of nitrogen should be applied the first year, but the subsequent applications should be not over half as heavy. By this carefully conducted and thorough test to find if nitrogen applied in liquid form to the tops of fruit trees has a stimulating effect upon the tree, not one indication has so far been found that it has. On the other hand, it is plainly shown that regardless of the manner in which the element is applied to the soil, whether in liquid or crystalline form, it gives very strong and prompt invigorating influence to the plant. This determination, although startling in its effect upon the yield and vigor of fruit trees, appears to be of no great scientific importance. However, it is of very great economic significance owing to the important practical problems upon which it throws a strong light. The three most important results of the work are: (1) It shows plainly the extent to which the nitrogen store of the soil has been depleted by the long-continued system of culture that has been practiced, and the great rapidity with which the trees can be restored to normal vigor by application of this element. (2) As no beneficial influence of sufficient importance to be observed has resulted to the physical character of the soil from the application of nitrogen in the form of nitrate of soda, the use of nitrogen in this form should be very limited. It finds its greatest value for the purpose of stimulating very weak trees until such time as leguminous crops can be grown and turned into the soil. (3) When nitrate of soda, as a source of nitrogen for devitalized and unfruitful fruit trees, is to be applied it can be done more cheaply and with equal results by distributing the crystals upon the ground in early spring and working them in instead of going to the expense of preparing a solution and applying it in the form of a spray.

The cost of nitrogen in nitrate of soda applied at the above rate is approximately \$16.00 per acre. An average crop of vetch, which can be grown for \$10.00 or less, accumulates about 74 pounds of nitrogen, approximately as much as was applied to these trees.



In addition to the benefit derived from incorporating the vegetable matter into the soil the nitrogen can be acquired more cheaply by growing legumes than by purchasing commercial nitrogen. By the proper use of live stock a large portion (possibly 80 per cent) of the fertilizer value of forage consumed should be returned to the land and a moderate profit derived from feeding it. Nitrogen in its various commercial forms should not be generally used. It is desirable for extreme cases only, as similar and far more permanent results can be gotten by the use of leguminous crops. Not only does the application of nitrogen-bearing organic matter supply the much-needed nitrogen to the trees, but it exerts a very beneficial and lasting effect upon the tilth and water-holding capacity of the soil. A very striking example of the influence of clover upon the condition of the soil and the growth of trees upon it exists in a Hood River orchard in which a portion of the land was devoted to clover previous to planting of the trees. Although the trees are about 18 years of age, the soil is in better physical condition and the trees are considerably larger than in the remainder of the orchard.

The system of cropping that should be used depends largely upon the available supply of moisture. Where irrigation is not provided for the use of winter cover crops of common vetch (*V. sativa*) or hairy vetch (*V. villosa*) should be used. This practice, followed by systematic clean cultivation throughout the summer, will maintain the fertility of the land and result in the greatest possible economy of the limited supply of moisture, all of which will be needed by mature fruiting trees. Upon irrigated land more or less permanent crops can be grown in the orchards, as has been partially demonstrated in all parts of the district. The crop that is of greatest value for use in the orchard has not yet been fully determined.

Red clover has many advantages over alfalfa for use with fruit trees in the orchard. Clover is preferable to alfalfa in a minor way on account of its greater tolerance of shade and cool weather and consequent longer period of growth. The principal feature in which clover is superior to alfalfa is the influence it has upon cultivation of the soil by its habit of dying out at the end of the second or third year.

Frequent thorough stirring of the soil is very necessary for many reasons, the principal of which are to permit its being properly aerated, which process is vital to the life and activity of myriads of bacteria whose function in the soil is to bring about the decay of organic matter with its consequent action upon the many elements of plant food within the soil. Where alfalfa is used the tendency is to not cultivate the soil sufficiently. Once this crop is well established the land can be thoroughly worked at frequent intervals with no appreciable injury to the plants, but it is seldom done.

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One of the greatest benefits to be derived from the growth of leguminous crops in orchards are those resulting from the influence of the vegetable matter upon the physical condition of the soil and from the result of decay of this material rendering its chemical constituents available as food materials for the trees whose welfare they are designed to influence. The sooner crops are plowed into the soil and allowed to decay, the sooner will their beneficial influence be felt. The refrigerant effect of the shade of such crops and the application of irrigation water appear to have a beneficial influence upon the trees. This and the possible influence of legumes being associated with non-legumes frequently exerts a marked influence upon the appearance and vigor of trees before an appreciable amount of plant material has decayed upon or within the soil.

A splendid example of what can be accomplished by the proper use of cover crops is the orchard owned by F. R. Radford, which is upon a soil very similar to the above experiment. When his orchard began to show signs of distress, some seven or eight years ago, he began immediately to use winter cover crops, and continued systematic clean culture during the summer season. During the past three years he has applied irrigation and is growing clover and alfalfa. He has also gone over the entire tract with a light application of stable manure. As a result of this careful treatment three successive crops of fruit have been received, and the trees are quite vigorous and thrifty in appearance. Indications are that in this orchard, while bearing full crops of fruit, the trees are being forced into too strong wood growth. From this it appears that too great an amount of nitrogen is being supplied to them. Thus it appears that the use of leguminous cover crops can be overdone as well as can the use of commercial nitrogen.

Upon the appearance of such a condition the crops should be dispensed with for a time and systematic clean culture again brought into practice. These results suggest the feasibility of adopting, within the orchard, a systematic system of crop rotation planned to maintain the fertility of the soil by growing certain crops on different portions of it in regular succession. Such a practice would be a most valuable method of operating an orchard, for by its use sufficient forage could be grown for the stock necessary upon the farm and the labor would be equally distributed throughout the year, and from year to year. It would also foster economical and constant use of irrigation water, and, in the end, would bring about a most accurately-balanced series of farm activities, which condition is conducive to the greatest possible economy in operation, a factor which I consider to be next in importance to the maintenance of a desirable state of fertility within the soil.



# Tomato Blight a Serious Menace to Tomato Industry

By F. D. Heald, Professor of Plant Pathology, Washington State College, and Plant Pathologist of the Washington Agricultural Experiment Station

**D**URING the past 20 years tomato blight, known also as the "yellow blight," "yellow blight" or "western blight," has been a serious menace to the tomato-growing industry in many parts of the Pacific Coast country. Up to the present time the trouble has been supposed to be peculiar to the Pacific Northwest. Various investigators have given more or less attention to the study of the disease since 1896, but the first publication claiming the establishment of the cause of the trouble appeared in 1914. In the bulletin referred to H. B. Humphrey, in "Studies on the Relation of Certain Species of Fusarium to the Tomato Blight of the Pacific Northwest," claims that tomato blight is caused by one or more species

of Fusarium which parasitize the root system. His results were based upon observations covering a number of years, but notwithstanding this fact there seemed to be some ground for questioning the reliability of his conclusions.

A strong element of doubt was introduced for two reasons: (1) The tomato blight is lessened in severity by certain factors which ordinarily are favorable to Fusarium diseases, notably, increased use of fertilizer. (2) The symptoms of the disease, as recorded by Humphrey and others, are different from what one would expect if the causal organism were a Fusarium. On account of this doubt as to the true cause of the disease the investigations carried out during the past season were directed in the main to discovering this one fundamental fact, the cause of the disease. It should be constantly borne in mind that the important point in all control work is clear and definite information concerning the cause of a

description of the symptomatology characteristic of the disease. The great variation in the symptoms accompanying the attack should lead us to discard the old names, such as blight, yellows and yellow blight, while western blight is equally objectionable, since the disease is not peculiar to this region. The least confusion will prevail if we designate the disease by the



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The investigations carried out at the Experiment Station during the past season, as well as the field observations made at various places in the state and adjacent territory, have all pointed to the fact that tomato blight is caused by the sterile fungus, Rhizoctonia, and that the species of Fusarium reported by Humphrey are entirely secondary in their relation to the disease. It seems strange that with all the work of able investigators during the past twenty years, the cause of tomato blight should have remained a mystery up to the present time. This is no reflection upon the ability of the workers connected with this problem, but rather points to the difficulties that the scientist encounters when delving into the realm of the unknown.

In the light of the investigations conducted during the past season it will be necessary to revise somewhat the



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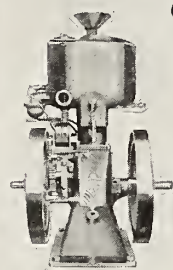
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name of the causal organism and speak of the trouble as the "Rhizoctonia disease."

Confining our attention first to the disease as it appears upon plants that are mature or approaching maturity, the deviations of the affected plant from the normal may be noted. The following most prominent effects upon the aerial parts of the plant may be observed: (1) Dwarfing or reduction in size of the entire top. (2) The production of the rosette type of growth. (3) Discoloration of the foliage. (4) Curling or rolling of the leaflets. (5) Reduction in size of fruit and premature ripening or failure to set any fruits. (6) Wilting and death of entire top.

The parasite is not present in or on the aerial parts of the plant, the deviation from the normal being due to the indirect effect of the parasite upon the root system or basal portion of the stem at or below the ground level. On these portions of the plant the following changes may be noted: (1) A network of brown fungous filaments upon the surface of the roots. (2) The occurrence of black nodules or masses (sclerotia) at various points upon the roots. (3) The presence of dead corroded areas (lesions) upon roots or basal portion of the stem. (4) The death of roots from the tip backward. (5) An abnormal production of adventitious fibrous roots.

The reduction in size of the entire top may be very pronounced or scarcely noticeable, depending in part upon the time of the attack and in part upon the rapidity of progress of the disease. In case the attack becomes severe in the early part of the development of the plant, the drooping effect will be the most pronounced. In late infections or light attacks of the disease the affected plant may reach nearly normal size.

Affected plants may show the rosette type of growth, or this effect may be almost entirely absent. In the extreme development of the rosette habit the plant may remain under-sized and produce an abnormal number of closely-clustered branches with the complete elimination of fruit production. This behavior led to the use of the term "tomato rosette" for this disease in Ohio and other sections of the Eastern United States. Seriously affected plants that first exhibit the disease late in their development are likely to show more than an ordinary production of branches from the lower-leaf axils, in case the fatal culmination of the disease is delayed.

Color changes of the foliage are among the noticeable of the symptoms. The affected plant may show a general pallor with more or less yellowing of the leaves over the entire plant or the color change may be more localized. The foliage of one branch may show a yellowing while that of the remainder of the plant is normal. In many cases it is the lower leaves of the plant that show the first yellowing, although this is not an invariable rule. The



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chlorotic foliage soon begins to show more or less brown dead tissue and in many cases the dead areas appear first between the main veins or at the margins of the leaves, that is, at points farthest removed from the water-conducting channels. In many cases the affected plants show more or less purpling of the leaf veins upon the under surface, although this is not a constant characteristic and may even be exhibited to some extent by healthy plants. The glaucous or grayish sheen of affected foliage is not constant, although in some cases it is quite noticeable.

The curling or rolling of the leaflets is very characteristic, although not a diagnostic character. There is a pronounced tendency for the edges of the leaflets to roll upward and inward toward the midrib. Again, this character may be very pronounced or only moderately developed. In some cases the leaflets appear to be more rigid than those of healthy plants.

A seriously affected plant may succumb before it has reached a sufficient size to set any fruit, but in the majority of cases the culmination of the disease is not reached until the host has fruit that is a third or more grown. The attack of the disease hastens the maturing processes and retards the growth of the fruit in size, many of which ripen prematurely. A mature plant that has succumbed as a result of the disease will show brown dead foliage and many under-sized fruits that possess a depth of color indicative of ripeness.

In a certain per cent of the attacks the affected plant which has exhibited some of the various symptoms mentioned, will succumb before the end of



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the growing season, while in other cases the plant will survive, but will make only a poor development. The writer has seen some fields in which all individuals of a certain variety were showing symptoms of the disease to a greater or less extent.

The roots of a normal tomato plant when removed from the soil and freed

from dirt are smooth and of a pale-straw color. Affected roots show varying degrees of darkening and an examination with a hand lens will show in many cases that they are covered with an interlacing network of minute brown threads or filaments, the mycelium or vegetative body of the fungus. In the younger stages or under cer-





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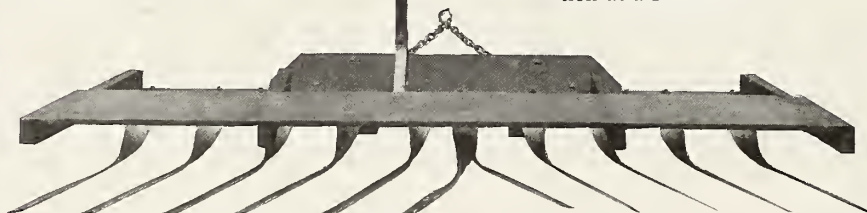
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tain growth conditions these filaments remain colorless, and so are not evident even with the hand lens. In some cases the network of fungous filaments may be so abundant as to be distinctly noticeable to the naked eye. The demonstration of the presence of the fungus upon the roots is one of the most certain methods of diagnosing the disease.

Black nodules or masses of fungous tissue, which have the appearance of dirt that will not wash off, may frequently be found on the larger roots. They may vary in size from mere specks to masses a quarter of an inch in diameter. These are the so-called sclerotia, or resting bodies of the fungus. They are produced very rarely upon the roots of some varieties, while certain varieties, like the Dwarf Champion, for example, produce them in abundance.

Dead corroded areas of varying size may be found upon the roots or upon the basal portion of the stem at or below the ground level. The death of the roots from the tip backward is, however, more common on the tomato than scattered or separated lesions. The young absorbing roots appear to be killed first and then the larger lateral-conducting roots. In an advanced stage of the disease, the cortex or outer portion of the larger roots may be more or less disintegrated and separate easily from the firmer central axis. The killing of the absorbing roots is the most serious phase of the disease.

An abnormal production of fibrous roots from the base of the stem is a frequent accompaniment of the disease. This condition prevails if the plants are set fairly deep and receive a sufficient supply of moisture. This increased production of roots frequently prolongs the life of the plant, since the work of absorption generally performed by the more widely distributed roots is provided for, until the new roots in turn are killed.

Rhizoctonia does not confine its attacks to maturing plants, but affects tomato seedlings, producing the trouble known as damping-off. In this case the fungus attacks the young stem at or near the ground level and the sudden drooping of the young plant is the result. The little seedling "drops dead" as it were. Damping-off of tomato seedlings by Rhizoctonia has been reported from various parts of the United States, both east and west and in the extreme south.

Another phase of the disease is worthy of mention, although it is of minor importance. The fungus may invade the ripening fruits and cause a characteristic rot. This condition is only found when the fruits rest upon the damp ground in which the fungus is growing. The fruit rot has not been observed in our work during the past season, but the writer studied it a number of years ago in Nebraska, and other investigators have reported the same condition in Florida and Cuba.

Continued in next issue



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WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

## Destructive Plant Lice, or Aphids

Continued from page 16

of the poisoning. It is often malformed and usually hangs on the branches longer than normally.

The stem mothers of the Rosy Aphis hatch very early in the spring and soon push their way into the swelling buds. Sometimes a dozen and more of the minute green lice, blueish with a coating of whitish powder, can be found within a single bud. The second-generation females quickly curl the leaves, making their control by spraying them practically impossible. The pupae of the winged generation are yellowish pink in color, but the adult migrants have a black thorax like that of the Green Aphis. The entire life cycle is supposedly spent on apple trees. The males, appearing in late fall, are winged, resembling the migrants, but the true females are wingless. The eggs of this species are laid near buds rather than on the open bark. Undoubtedly this is one of the most serious of orchard pests, ruining millions of dollars' worth of fruit. It is comparatively a newcomer in the Northwest, having been introduced in the egg-stage on imported nursery-stock, but it is yearly extending its range and destructiveness.

The Alfalfa or Clover Aphis has a more complicated life history. In early spring this species is an orchard insect, developing from eggs usually laid on apple trees. The stem mothers are greenish, mottled with red, and hatch very early in the season. As before, there is the usual second generation of wingless, parthenogenetic, viviparous females, followed by the winged third generation. These migrants leave the winter host plants to seek clover or alfalfa, and their pinkish colored descendants are destructive summer pests of these field crops. In the fall of the year another generation of winged lice appears, the returning migrants, which seek the orchards, and there give parthenogenetic birth to the sexed males and females. Here is exhibited Nature's further provision to take care during the winter of a field insect which otherwise would perish in excessive numbers if remaining on the ground.

It is extremely difficult to trace the wanderings of migrating plant lice, so the wonder is that students have already learned the life histories of the large series of species known. Some of our commonest species lead a dual, or better a multiple, life, devastating a large number of plants. The commonest peach aphid has a list of a hundred summer plants, some roadside weeds and some growing in our gardens. The hop aphid winters on plum trees, or where they cannot be found, the returning migrants of the fall select cottonwoods or willows. The wheat aphid survives the winter on apple or other trees. It would therefore follow that the simplest way of controlling the

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aphids of wheat, alfalfa or hop fields would be to destroy their stem mothers in nearby orchards.

On the other hand, the life histories of many important species are imperfectly known. Where do the winged cabbage lice migrate in the fall? Do the extremely few eggs left by the black cherry aphid on cherry trees represent the only method of carrying this species over the winter? If so, why do not the lice appear in earliest spring, or why cannot this insect be controlled by winter sprays destructive to aphid eggs? Does the woolly aphid of the apple necessarily spend the winter as hibernating individuals on the roots, or do our Western specimens follow the recently-discovered routine of migrating to elm trees to deposit winter eggs? Some of these puzzles are intimately correlated with methods of treatment and should be solved as soon as possible.

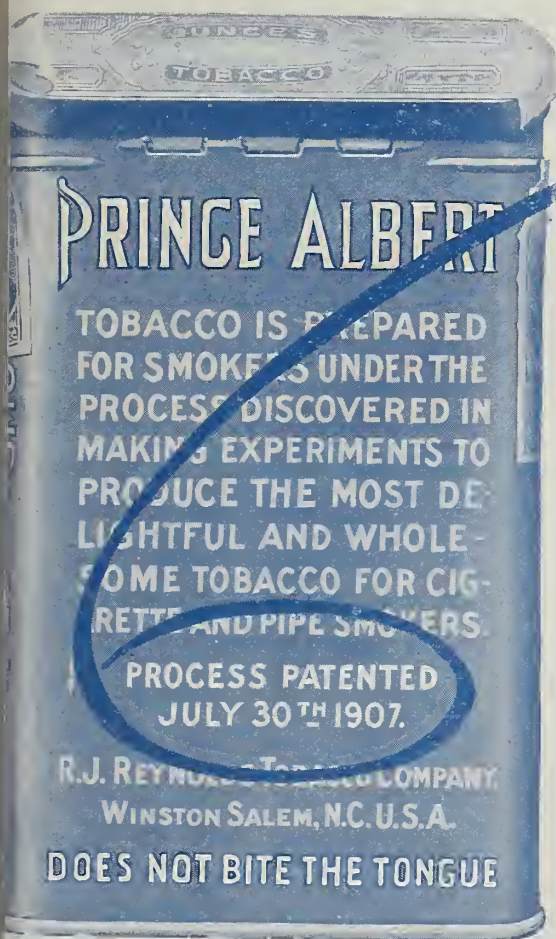
The best single material found to control aphids is nicotine, which is now readily obtainable on the market in concentrated form. The usual 40 per cent nicotine sulphate is fatal to plant lice when diluted approximately one part to one thousand. The addition of soap at the rate of a pound to one hundred gallons vastly improves the use of nicotine as a summer spray. Spraying should be undertaken before the aphids have curled the leaves or it becomes impossible to wet all the insects with this contact spray. If only a few are missed the prolific insects increase in a few days to even greater numbers than before. The same material may be directed against the sexual egg-laying females in the late fall of the year after the fall migrants have returned to the trees.

Sulphur-lime is generally accredited as a valuable winter treatment for aphid eggs. While orchards regularly sprayed with sulphur-lime are freer from aphid injury than those unsprayed it seems that the benefit comes principally from the after effects on the hatched stem mothers, for aphid eggs hatch apparently as well whether sprayed with sulphur-lime or not. This is largely true also in the case of oil spraying. The addition of nicotine to sulphur-lime, however, produces a spray fatal alike to eggs and precocious stem mothers, and as the combination is more effective against scale insects and orchard mites it probably is a practice worth while. The standard formula designed for application when buds begin to swell calls for one gallon 40 per cent nicotine concentrate, seventy gallons full-strength (33%) sulphur-lime and nine hundred and thirty gallons water. To this no soap should be added.

Aphids on ornamental plants or on city trees can usually be successfully combated by using the garden hose with water under pressure. When the insects are forcefully knocked from the plants they rarely recover.



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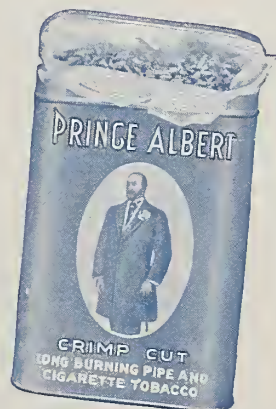
*the national joy smoke*

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